

Post Office Telecommunications Journal

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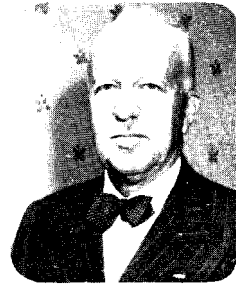
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Vol. 3

FEBRUARY, 1951

No. 2.

Walter
Sherman
Gifford



U.S. Ambassador
to the Court
of St. James's

IT IS OUR SPECIAL PLEASURE TO OFFER, ON behalf of our readers who work in the telecommunications services and industries in this country, a warm welcome and sincere good wishes to Mr. Gifford on his taking up duties as U.S. Ambassador in London. President Truman has selected for this post a man who has made his name in the sphere of telecommunications. Under his wise leadership as President and Chairman of the Board of Directors of the American Telephone and Telegraph Company for many years, he has seen the great telephone system of the U.S.A. mount from 11 million to 33 million telephones, in spite of the handicapping difficulties of two wars. It employs over 600,000 people. The responsibilities attaching to his office must have demanded great technical knowledge and the display of courage, foresight, sympathy and understanding. These qualities will be no less required for the task to which Mr. Gifford has now set his hand. Telecommunications people everywhere, one of whose special jobs it is to enable Nation to speak to Nation, will join us in wishing Mr. Gifford all success in his efforts to secure peace and understanding amongst the nations of the earth.

The Festival of Britain Takes Shape

by F. R. Allcroft, Public Relations Department

ALL THE WORLD HAS HEARD OF THE Festival of Britain. Users of Waterloo Station in London are all too aware of its location, for road traffic in that area takes all sorts of unusual routes to allow of arrangements being made for dealing with the expected visitors. Spectators on Waterloo Bridge and Hungerford Bridge no longer need to visualise the exhibition on South Bank, for it is growing visibly day by day and the shape of things to come is obvious. The Post Office is playing its part on South Bank, and from the early days of the scheme up to the present it has meant a lot of hard work and careful planning to our friends of the L.T.R. and the L.P.R. The provision of Post Office services throughout the site has been in the hands of a joint L.T.R.-L.P.R. committee similar to that which dealt so successfully with the problems raised by the Olympic Games in London during 1948. Even before excavation of the site began, they had to plan the requirements for ducts and for power lines, for telephone and telegraph

routes, for tubes and for the dozens of facilities necessary to the provision of adequate services of communication.

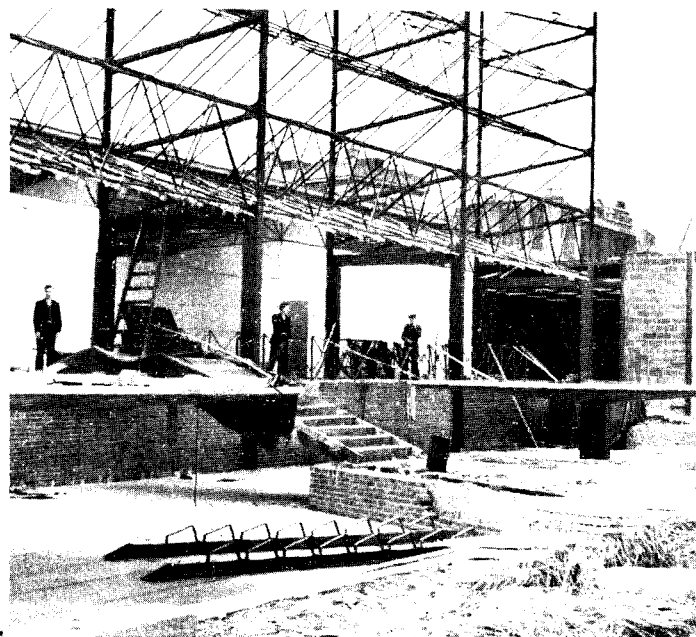
A photographic record of progress has been kept and the photographs shown here, taken by the Engineering Department, give an idea of what was happening in October last. Figure 1 shows the building for the Festival Post Office near the main entrance to the Exhibition. The suite of offices devoted to Post Office work will be fronted by a terrace overlooking a wide belt of water, from which will rise platforms (looking rather like mushrooms in the photograph) embodying stalls for the sale of items one usually associates with exhibitions—souvenirs, catalogues, etc. The offices will be in four parts. Reading from left to right in the photograph, they are (1) instrument and delivery room, (2) telephone bureau, (3) accounts balancing room and accommodation for officer-in-charge, (4) public counter.

Figure 2 shows the interesting direct daylight lighting through portholes in the roof of the public office. This lighting will be supplemented by artificial lighting as necessary.

Figure 3 shows the site of the Private Branch Exchange. This is immediately at the foot of one of the walls of the London County Council Festival Hall. Nearby will be the river (the photo is taken from the bank), the B.B.C. Control Room and the Shot Tower.

Figure 4 shows the skeleton of the Dome of Discovery, with the ubiquitous Post Office Engineering Van in the foreground. This building will be of supreme interest, housing as it will some of the noteworthy achievements of this country in the fields of science and art. The Post Office will, of course, be contributing exhibits.

Fig. 1—Building the Festival Post Office



The Post Office at the South Bank Exhibition

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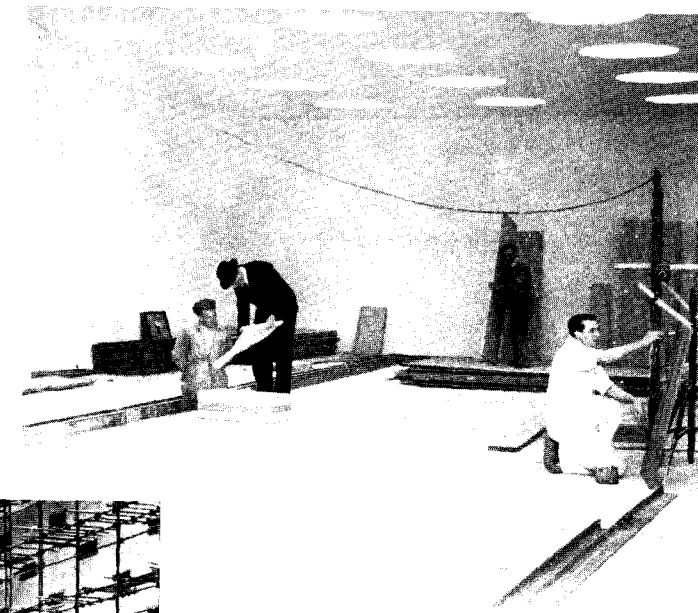


Fig. 2 above—Interior of public office. The counter will be situated along the wall on the left. The direct daylight lighting is noteworthy



Fig. 3 left—Site of P.B.X. L.C.C. Concert Hall on right

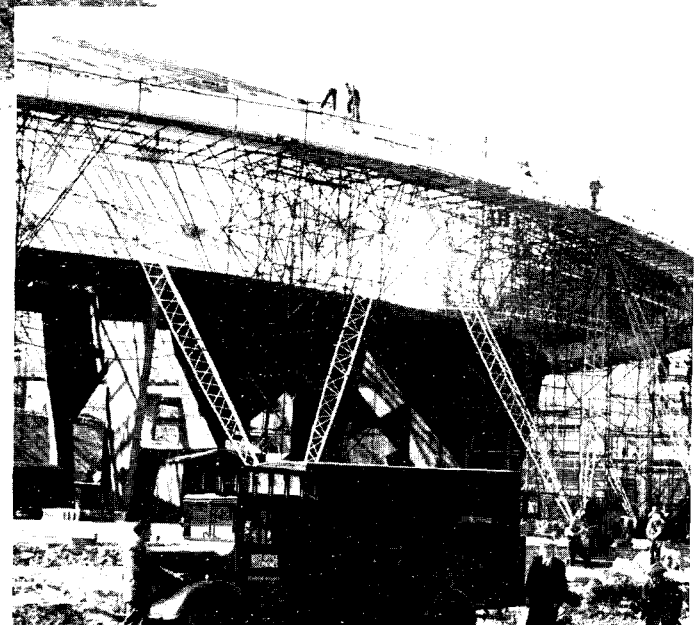


Fig. 4 right—The Dome of Discovery, in which several exhibits provided by the Post Office will be shown

The London Director System and its Overhaul

by G. S. Berkeley.

London Telecommunications Region

Why the Overhaul was Needed

AT THE OUTBREAK OF WAR, THERE WERE 764,000 telephone stations connected to 115 director exchanges within a circle of 12½ miles radius centred on Charing Cross. Putting this in another way—71% of the telephone subscribers in the most densely populated 500 square miles of London could telephone to each other without the intervention of an operator—a state of affairs made possible only by the installation and upkeep of much switching plant and its associated junction network. As may well be imagined, the direct and indirect effects of the war on all this plant were felt to an increasing extent in all directions as the years went by. The major effects are touched upon in the paragraphs below.

The supply of stores for maintenance replacement purposes was a continuous source of difficulty to the staff on the spot, to the Headquarters Branches and Departments concerned with placing orders, and to the manufacturers confronted with the Department's needs in the face of their own war-time difficulties.

Due to the lack of replacements, badly worn parts were made to do long after they were due for changing, despite the risks of irreparable damage later; selector wipers were retained in service, for instance, even though relatively large holes had been worn in their tips.

Apart from their own problem arising from labour dilution, manufacturers had at times to use substitutes for certain raw materials; in some cases, deficiencies in the substitute materials did not become apparent until the items had been in widespread use and had caused considerable service difficulties. Local improvisation was frequently necessary, even to the extent of using piece parts which fell short of the normal high

standards required by the equipment specifications.

The loss of trained Post Office maintenance staff to the forces was most serious. It was bridged by Female Assistants without any previous experience of handling electrical apparatus. Despite their technical handicaps, these Female Assistants—who numbered nearly a third of the total maintenance staff by the end of the war—did splendid work.

Direct effects of bomb incidents—either direct hits or near misses on exchanges—shook up the delicate electrical apparatus and scattered dust in many directions, and at the termination of hostilities the unbricking and reinstatement of windows led to dust being blown into the switching apparatus despite all the precautions that were taken.

Traffic on the director exchanges dropped by about one-third during the war years, but nevertheless an estimated 5,000 million call attempts were made on director exchanges in that period and it was obvious that exceptional measures would be necessary after the war to bring such a volume of overworked and maltreated plant to a condition where it could give a service anything like pre-war. In 1944, therefore, estimates of the number and types of piece parts necessary for a thorough overhaul were prepared. In the next three years, stocks of most of the parts were built up in preparation for the overhaul that was imperatively necessary.

The Plan of Campaign

In 1947, the London Telecommunications Region put its major overhaul in hand against a two years' target for completion. At the outset, the factors operating against this target were still the lack of trained staff, difficulties in recruiting



Overhaul work in progress at Holborn Exchange

suitable staff and "pegged" staff numbers. Four months after commencing the overhaul, only 30 men had been obtained, but by recruiting drives and the transfer of men from construction and other work, the equivalent of 300 were employed entirely on overhaul work just over a year later. The first photograph accompanying this article illustrates the arrangements made for the overhaul of switches at Holborn—one of the larger centres fitted with pre-3,000 type relays—where, among other items, some 10,000 subscribers' uni-selectors and 12,000 two-motion selectors were dealt with, involving the renewal of 16,000 relay spring-sets and heel pieces and 4,000 mechanically-operated and rotary interrupter spring-sets. At this exchange, where nine men were initially employed on the overhaul, the work was organised in six stages as follows:—

Stage 1—All dust removed and selector cleaned; relay contacts inspected and docket made out indicating those relays needing attention.

Stage 2—Relays with worn contacts dismantled from selector; heel pieces and spring-sets removed and sent to the Piece Part Depot for renewal.

Stage 3—New heel pieces and spring-sets fitted to relays, replaced on selector and approximate adjustments applied.

Stage 4—All mechanical parts and mechanically-operated spring-sets inspected; faulty items changed and adjusted.

Stage 5—Relays finally adjusted to the usual operate and non-operate tests.

Stage 6—Selectors returned to rack and subjected to auto-routiner and manual functional tests.

One Technical Officer was employed on each of Stages 1, 2 and 5 and two men on each of the remaining stages, this division proving an efficient and smooth working arrangement with an even flow of work. The duties of the staff employed on the overhaul work were rotated at intervals through the six different stages, to lessen the monotony.

Many of the exchanges did not warrant attention on the scale indicated in the foregoing and, depending on local conditions and requirements, the work was organised in various ways. In some cases, the men were arranged in small parties, each party staying at one exchange until its overhaul was completed, then moving on to the next requiring attention; in other exchanges, the normal staff was augmented and a portion of the total staff set aside for overhaul work for a certain period, after which they changed places with the staff employed on exchange maintenance.

In general, the more heavily worked apparatus, such as "A" digit selectors, directors and first-code selectors, were overhauled first, followed by the group and final selectors and subscribers' calling equipments. The amount of work involved may be judged from the fact that half-a-million single-motion switches and nearly half-a-million two-motion selectors were attended to. It was necessary to remove most of the two-motion selectors from the racks, even those not requiring the fitting of new parts, in order that



Relay assembly adjustment and testing in progress at London Piece Part Depot

they could be thoroughly cleaned and adjusted on the bench. Some hundreds of thousands of relays and mechanically operated spring-sets were changed because of contact wear and, in addition, many thousands of other mechanical parts. In one case, the overhaul brought to light a serious deterioration of switchplate wiring affecting a large proportion of the two-motion selectors in the exchange.

Many of the component parts (over 80 separate items) which go to make up 2,000-type and pre-3,000 type relay group selectors are manufactured to within one or two thousandths of an inch, and maladjustment or wear of a few thousandths of an inch on a particular item may cause incorrect stepping or operation of a switch and the consequent failure of a call.

Work at the Piece Part Depot

The London Piece Part Depot is the centre to which all London Exchanges (as well as all others in the southern half of the country) fitted with pre-3,000 type equipment look for their maintenance replacement parts, and in order to cope with the overhaul demands, the staff at the depot was more than doubled. In addition to the issue of new Piece Parts of non-standard items as received from the manufacturers (of which a stock of approximately 9,000 different parts is normally held), the main work involved the dismantling of non-standard relays and mechanically operated spring-sets and replacement of the

worn parts. All relays received in the depot were dismantled and the springs sorted into their various thicknesses and despatched to the Birmingham Piece Part Depot, where they were given new contacts and burnished. On return, the springs were re-assembled to make up the particular types of relay spring-set combinations needed. The magnitude and detail of this work may be judged from the fact that 8,000 different types of relay spring-set combinations are used in the various types of non-standard exchanges existing. (It is of interest to note that a number of blind operatives performed very useful work in assembling relay springs, the final check and adjustments being undertaken by sighted staff.) Apart from the 200,000 relay spring-sets and 75,000 mechanically operated spring-sets renewed at the depot, many thousands of other transactions were also completed. With these heavy demands being made from exchanges all over London, it was necessary to plan carefully both the amount of work to be undertaken at each exchange and the volume of work which could be completed at the depot every month, in order to ensure a fair flow of parts to each exchange demanding them.

Local-Call Switching Equipment

The establishment of a local call on a director exchange involves the use of at least six switching stages, whilst calls routed via a tandem centre may use up to nine or ten. In the conversation path of a local call on a director exchange (which

in the smaller exchanges may involve only four switching stages), it may not be realised by the ordinary telephone user that the subscribers can nevertheless be connected in nearly 200,000 ways, whilst still getting the right number! i.e., there are nearly 200,000 electrical routes for setting up a call between two subscribers, according to the choice of contacts on the selectors available at the several switching points in the train; this number neglects the common equipment. In addition to the millions of parts which go to make up the switch mechanisms, therefore, and which have to be kept within precise tolerances of adjustment, the electrical interconnection of many of the parts and the interconnection of the various switching ranks within the exchange involve the use of many miles of wire and thousands of soldered terminations. In a 10,000-line exchange, for instance, there may be more than 12 million soldered wire ends. The majority of the soldered points are those occurring on the selector bank multiples, and these are most vulnerable to high-resistance joints and disconnections caused by the vibrations set up by the selectors operating and releasing, and by obscure changes in the characteristics of solders. A high-resistance joint or the disconnection of a single wire in any one channel used for setting up a call will prevent a successful connection

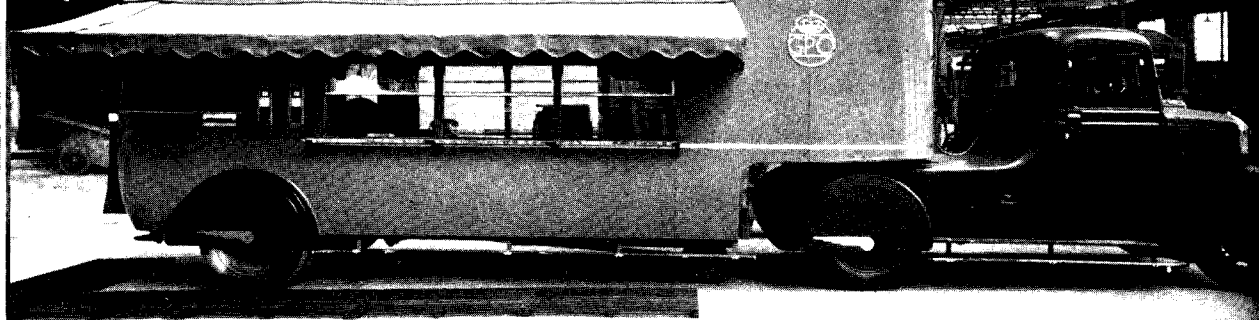
every time this channel is seized. The full benefit of the overhaul of switches would not therefore have been felt unless measures had also been taken to check the wiring side of the exchanges. Accordingly, continuity tests were made of the hundreds of thousands of switch multiple bank wires, whilst the various frames were inspected for doubtful soldered joints.

Part of Stock Room at London Piece Part Depot



Overhaul Completed

The overhaul is now over and one may be tempted to ask whether the job was worth doing and the expenditure in time, effort and hard cash justified. Service observations show that a most worthwhile improvement has been achieved, inasmuch as the first-attempt call failures due to plant faults have been reduced from 9% in 1946 to 6% in 1950, which is better than the pre-war figure. At the same time, written complaints from the public have been reduced by a quarter. Troubles giving rise to non-metering of subscribers' effective calls have been reduced by the overhaul to an extent such that the lost revenue avoided over the next year or two will go a long way towards paying the cost of the overhaul! By far the largest number of first-attempt calls which fail arise from subscribers' lines being engaged or the called party not answering. It is difficult, therefore, to obtain an accurate cross section of public opinion of the improvement. Nevertheless, the London Telecommunications Region is satisfied—and the service observation and public complaint results quoted in the preceding paragraph bear this out—that by careful organisation and meticulous though monotonous work its Director system has been brought back to good condition, with the prospect of many years of useful life ahead of it.



G.P.O. 1 ***The Post Office on Wheels***

by J. H. Richardson,
Public Relations Department

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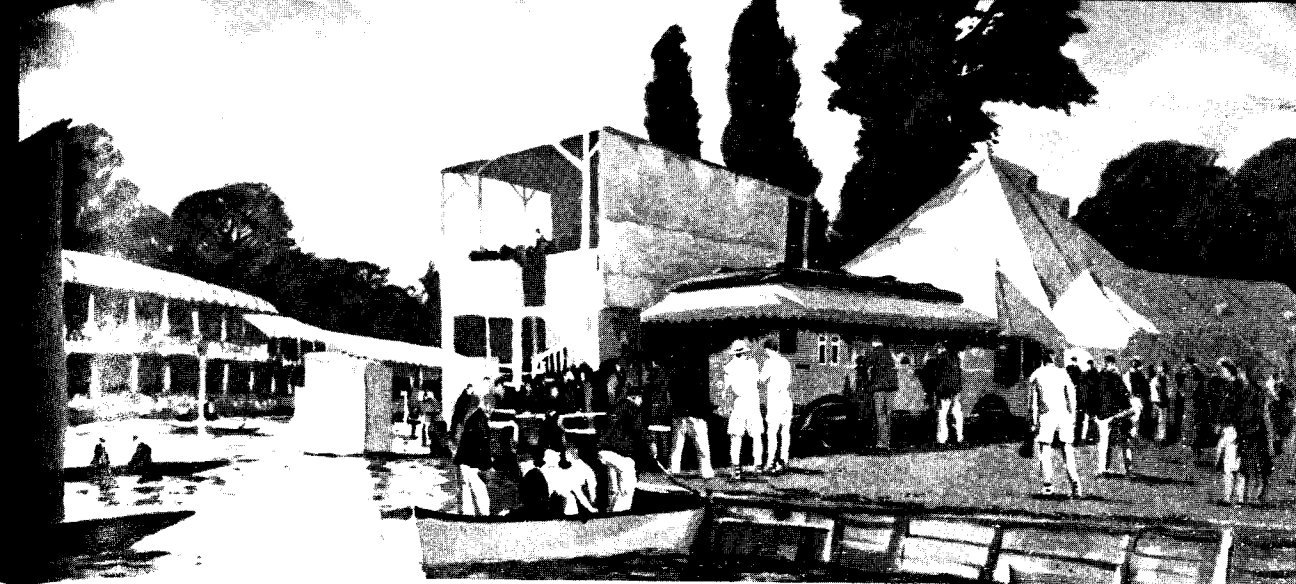
IN THE STORY OF THE WANDERINGS OF Israel out of captivity, there is a reference to Succoth—the place of tents—Boothstown! Modern conventions often follow the same pattern. Race meetings, agricultural and flower shows, farmhose and international rallies, Eisteddfodau, internationally important from the point of news, of business, prices etc., are often modern boothstowns, planted in the open spaces of land and sky and remote from normal communication facilities. These events are known in the Post Office as “special” events.

The efficiency of the temporary communication facilities, postal, telegraph and telephone, which the Post Office provides, owes something to the Mobile Post Office, which, from its colourful (Post Office red and black) appearance and lines, always earns many tributes for the Post Office from the public it serves. The design and construction of the vehicles, to the specifications set by the operational departments, postal and telecommunications, were carried out by the

Engineering Department (Motor Transport Section).

The problem was not easy; there were legislative limits of size, viz. length 33 ft., width 7 ft. 6 ins. The “counters” had to be related to the height of the customers standing at ground level. The need for manoeuvrability necessitated the provision of an “articulated” type of vehicle, e.g. a trailer, otherwise access to locations through twisting lanes and field gates would have been impossible. At all stages, economy of cost had to be borne in mind. The result is a vehicle which looks as if it means business. It fits picturesquely into scenes as diverse as Ascot Races and Henley Regatta, on the one hand, or the Welsh National Eisteddfod on the other.

The exterior is cellulose finished; the mudguards have a flying-wing ornament and the first vehicle carried the index number GPO 1. For publicity reasons, the Ministry of Transport was asked to agree the registration index letters GPO for special vehicles like the Mobile Post Office.



The Mobile Post Office at Henley Regatta (from a poster by Adrian Hill)

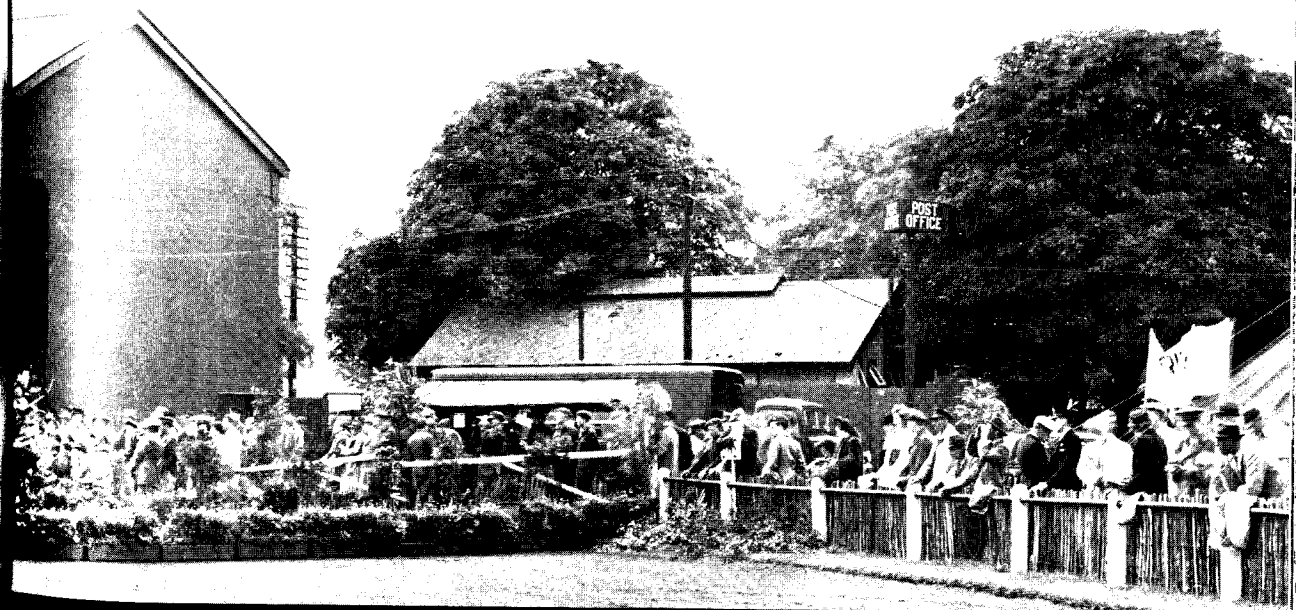
The Ministry agreed and the index mark has been allotted to the London County Council for the exclusive use of the Post Office. It is not possible, for obvious reasons, to station the vehicle at events which are of longer duration than a few days, as this tends to immobilise the vehicle.

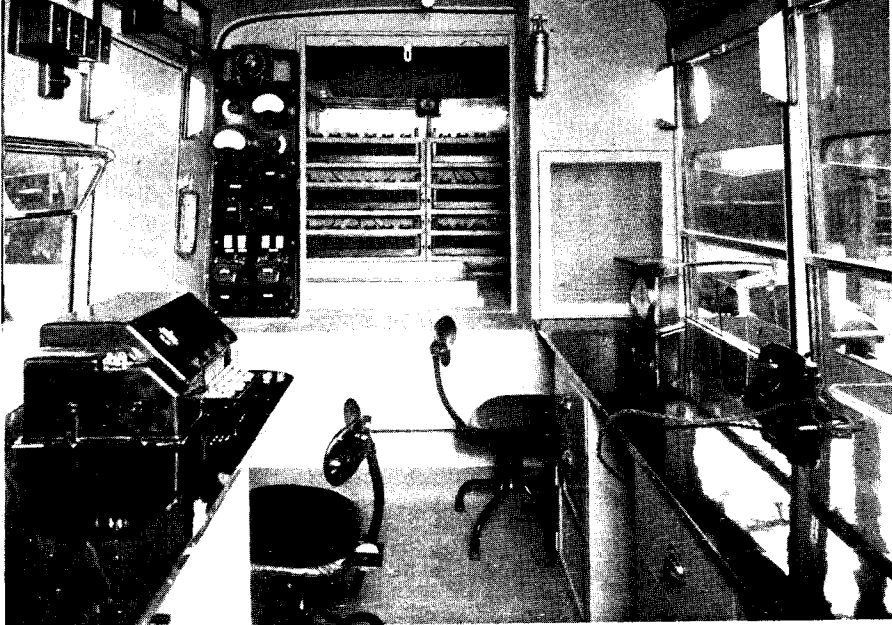
The equipment consists of counter accommodation for the sale of stamps and the keeping of

cash. Two call offices are provided in the rear of the vehicle and a teleprinter is also installed. The call offices are screened off from the rest of the vehicle.

The problem of labelling the vehicle assumed importance from the fact that other organisations now also provide mobile units. There are, for instance, mobile cinemas, television vans and banks. After extensive experiment, it has been

The Mobile Post Office at preliminary Horse events, Olympic Games, Aldershot, showing the collapsible triangular sign, which was visible from $\frac{1}{4}$ mile distance





The Mobile Post Office, interior view, showing stamp counter and teleprinter

agreed that a sign visible from all angles and raised well above the height of the vehicle and of surrounding objects, such as marquees, is probably the best so far. A triangular sign (which folds flat for packing) was tried at the Olympic Games at Aldershot in 1948. This, however, necessitated the special stepping-in of a pole by local engineering staff. The latest development is an extensible mast with wire stays, which can be carried with the trailer. Mobile Post Offices in Germany, before the war, carried a streamer, just above the roof of the vehicle, suspended between uprights fixed at the fore and rear ends of the

trailer, but the result was untidy and probably not effective. The corresponding French vehicle seen by the writer in 1948 was painted in battleship grey, without much attempt at display. There are now two Mobile Post Offices and during the season they have on the average a programme of twenty events each.

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With acknowledgments to the article on this subject by W. G. Dunk and C. F. Mills in "The Post Office Electrical Engineers' Journal" of October, 1936, from which some of the information in this article has been drawn.



GPO 2 at the Royal Horse Show, Richmond. The extensible mast is anchored to the ground and the vehicle. Mast and sign pack into small space when not in use.

Contemporary Telephone Mechanisation Abroad and Possible Future Trends (2)

by J. A. Lawrence, A.M.I.E.E., Engineer-in-Chief's Office

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Here, the author discusses the problems involved in extending subscriber-dialling facilities to longer distances and describes the principal features of foreign solutions to these problems. National dialling will be dealt with in the next and final instalment.

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IN THE PREVIOUS ARTICLE, THE principal features of local automatic systems were outlined. It was shown that, while each of the three basic systems had its own special advantages, all three could be adapted to solve any problem of automatic switching. It follows that inter-working between the various systems (and within-system variants) is also practicable. The problem of inter-working between different automatic networks, whether containing similar or differing basic types of exchanges, arises almost as soon as a second automatic area is opened for service in any given country. Thus, soon after satisfactory "local" automatic exchanges had been developed, a demand arose for facilities to permit subscribers to dial beyond their local networks, firstly to adjacent and then to more distant networks. Such problems of inter-working have been solved successfully in a variety of ways, and the attention of the telephone industry is now turning towards the development of national subscriber-dialling systems, leading ultimately, perhaps, to international subscriber-dialling.

Short Range Subscriber-Dialling and the Charging Problem

The demand for extended subscriber-dialling

over "short" distances was fairly easy to satisfy, at least in the early stages, so far as dialling was concerned, but it introduced the problem of automatic call charging. This problem is still a difficult one and is likely to become more important as the range of subscriber-dialling is increased. The magnitude of the problem depends on the tariff system in operation. Thus, if subscriber-dialling is restricted to an area over which a "flat-rate" system of charging is used, as in many parts of the United States, there is no charging problem. When, however, it is desired to extend subscriber-dialling to points outside the permitted flat-rate area, the problem of identifying the wanted exchange and recording the call charge arises. If all subscriber-dialled calls have to be recorded (as in this and many other countries), there are two methods available:—

- (i) To record the calls as pulses on a subscriber's meter—generally referred to as multi-metering.
- (ii) To prepare call record tickets automatically.

If calls originating and terminating in the same exchange, as well as calls to other exchanges, have to be recorded, method (i) is far cheaper.

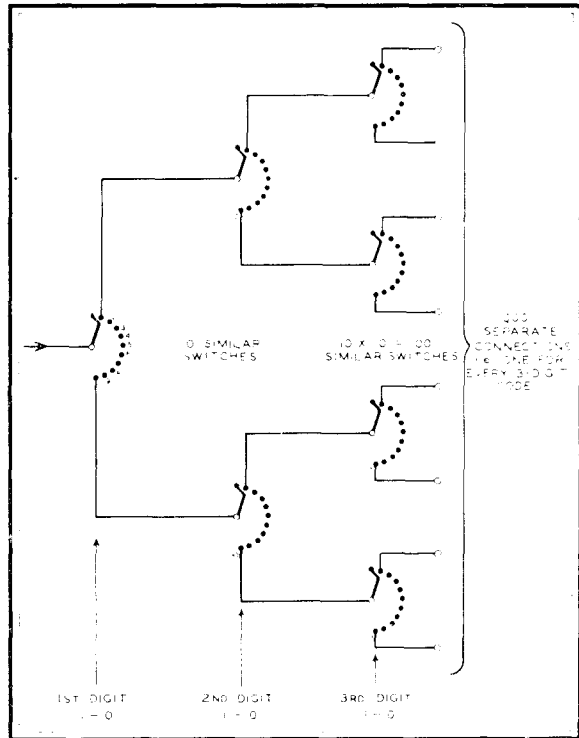
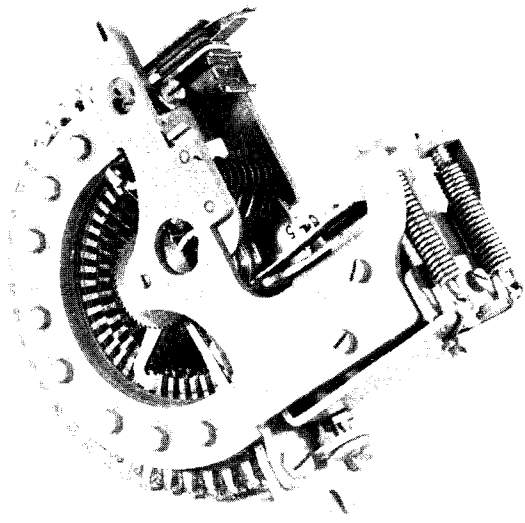


FIG. 1—PRINCIPLE EMPLOYED TO IDENTIFY THE PARTICULAR COMBINATION OF DIGITS DIALLED BY A SUBSCRIBER

FIG. 2—A DIGIT RECORDING SWITCH



because of the large volume of unit-fee calls, and this method is most generally employed abroad. For example, Germany, Sweden, Switzerland, Holland and France all employ variations of the basic technique of multi-metering, by which calls are recorded on subscribers' meters as single or multiple-unit calls according to the dialling range permitted, the tariff system in force and, as necessary, the call duration.

Automatic ticketing finds its principal application in the United States, where it is already used fairly extensively, to record subscriber-dialled multi-fee calls in areas where there is a flat-rate tariff covering each originating exchange. The ticketing equipment is picked up only when a subscriber-dialled call passes out of the flat-rate area, and the uneconomic preparation of tickets for "cheap" calls is avoided. In such circumstances, automatic ticketing is found to be cheaper than multi-metering, chiefly because subscribers' meters are not required. Once the ticketing equipment is available, it can, of course, be arranged to deal with long as well as short distance calls, and timing with day to night rate charges may be imposed as required. In America, the present trend is towards the introduction of automatic ticketing for both

short-distance multi-fee calls and long-distance toll calls. There is also an automatic ticketing scheme in operation in Belgium.

Multi-Metering

With multi-metering, the automatic equipment must be arranged to record the appropriate charge while a call is actually in progress and, therefore, a means must be provided whereby the automatic switching equipment can determine from the nature of a call the charge to be levied. In the general case, this means that the charge must be determined from the digits dialled by a caller and, technically, the problem becomes one of identifying separately various combinations of dialled digits. Usually the digits dialled by a subscriber consist of a code followed by a number and, broadly speaking, it is from the code that the charge must be determined. The kind of solution provided by the equipment designer is illustrated in Figure 1. In a typical

case, there would be a digit recording switch, such as shown in Figure 2, for each code digit dialled. The contacts of the first code digit switch would be connected to the wipers of the second code digit switch and so on. Clearly, as the number of digits involved in an identification of a wanted exchange increases, more switches (or their equivalent) are required and, although the method is simple, it is usually not economic to attempt to distinguish separately more than about 1,000 different combinations of digits. It is, moreover, desirable that all codes to be separately identified contain the same number of digits; for example, three.

The extent to which multi-metering can be applied to a telephone network economically is governed, therefore, by the amount of detail which enters into the assessment of a charge. If charges depend on the point-to-point distance between calling and called exchanges no matter where located, it follows that multi-metering cannot, by any method at present available, be economically extended to such a distance from an originating exchange that there are more than 1,000 exchanges within multi-metering range. If, on the other hand, exchanges may be grouped together into geographical areas, each having only one measuring point for charge assessment purposes, it is possible to extend multi-metering to the point where there are not more than 1,000 charging areas within multi-metering range of all the exchanges in an originating charging area. The ability of the automatic equipment to provide automatic charging facilities by multi-metering is therefore, at present, closely linked with the size of a network and the tariff policy of the administration concerned.

Automatic Ticketing

With automatic ticketing, the same difficulty need not arise, because, if the record prepared automatically contains the right amount of information, the actual charge need not be worked out while a call is in progress—in effect, an automatic ticket can be handled in exactly the same way as a manually-prepared ticket. It follows, therefore, that if an administration adopts automatic ticketing as a policy, the tariff system need not be affected by the introduction of automatic call recording. Automatic ticketing does, however, demand the provision of calling line identification facilities and, if subscribers' lines are already fitted with meters for say, local calls, the total

cost of automatic ticketing plus meters may be high in relation to the cost of either method used alone. For this reason, it appears that most foreign administrations have decided upon multi-metering as the method of charge recording, and in some cases the tariff system has been, or will be, adjusted to permit, ultimately, the extension of multi-metering to long-distance as well as short-distance calls.

Timing, either with multi-metering or automatic ticketing, is not a difficult problem. Most foreign administrations employ timing for all but local calls. (The term "local" may refer here to all calls within a specified area containing a number of exchanges.)

Typical Automatic Charging Schemes in Use Abroad

A typical scheme for automatic charging is that projected and partly implemented in Sweden. Charging is by multi-metering and, for a call between subscribers on the same exchange, the charge is one unit untimed. For a call between a subscriber on one exchange and a subscriber on another exchange within an area defined as the "home" area and containing some 30 to 40 exchanges, the charge is one unit repeated every six minutes. For calls between exchanges in different areas, the charge is still one unit, but the time of repetition is reduced. The maximum charging rate may be, ultimately, one unit every six seconds. The charging rate depends upon the distance between the originating and terminating areas.

Another scheme, used in Holland, provides for four variations of charging rate. Thus:—

- (i) Calls originating and terminating on the same exchange—one unit untimed.
- (ii) Calls originating and terminating within the same sector but on different exchanges—one unit on answer—five to ten seconds free time for number checking followed by one unit and, thereafter, one unit per minute.
- (iii) Calls between exchanges in adjacent sectors—one unit on answer—four units after free time followed by one unit per 30 seconds.
- (iv) Calls other than (i), (ii) and (iii)—one unit on answer—eight units after free time followed by one unit every 10 seconds.

In this scheme, a "sector" contains not more than 10 exchanges, the total number of sectors being about 120.

In Germany, a scheme for universal multi-metering is under consideration, whereby all calls up to 15 miles chargeable distance would be

charged as point-to-point calls, and all calls over 15 miles chargeable distance as area-to-area calls. As already mentioned, the principal application of automatic ticketing is to be found in the United States, where it can be used economically in flat-rate areas. In Europe, Sweden and Switzerland have specifically rejected it as being uneconomic, and in countries other than Belgium, the existing systems of charging tended to favour area-to-area charging, with the result that multi-metering is the method preferred. In Belgium, automatic ticketing has been adopted to permit the introduction of subscriber trunk dialling with separate trunk accounts for subscribers. Administrative difficulties may arise, however, in the application of multi-metering to all calls in countries larger than those mentioned, and these

will be dealt with in the final instalment of this article.

Author's Note: *It has been brought to my notice that in part I of the above article, published in the August 1950 issue of this Journal, I have suggested that the Swiss network contains mostly automatic equipment of a type usually classified under the commercial name of "Rotary". This was not the intention. In fact, about 70% of the exchanges catering for about 45% of the total subscribers' lines are supplied by the well-known Swiss firm of Hasler A.G., Berne.*

The Hasler equipment uses selectors, similar in appearance to the Ericsson 500-line selector, but driven by means of a self-contained "motor". The positioning of the selectors is controlled by means of a register as in the "Rotary" and "Ericsson 500-line" systems. Although, therefore, the "Hasler" system is one which may, quite properly, be classified as a register-controlled system, it should not be confused with those systems generally classified as "Rotary" systems, in which the selectors are driven by an external motor common to a number of selectors.

Commonwealth Telecommunications Board

An important series of technical and traffic meetings of the Board took place under the Chairmanship of Col. Sir Stanley Angwin, Chairman of Cable & Wireless, Ltd., in October and November of last year, at the Board's Headquarters at 28, Pall Mall, S.W.1. The chief object of the meetings was to secure a general review of recent technical developments in cable and wireless and their application to the Commonwealth system, including research work in telecommunications, in hand or projected, in each country. In addition to the standing members of the Board, representatives attended from the United Kingdom, Canada, Australia, New Zealand, South Africa, India, Pakistan and the Colonies. Observers also attended from the British Joint Communications Board.

The inaugural assembly was addressed by Lord Reith, Chairman of the Board, in person, and during the subsequent proceedings papers were read by such eminent personalities in the telecommunications world as Sir Archibald Gill, Assistant Director General (Engineering), G.P.O.; Sir Stanley Angwin, K.B.E., D.S.O.,

Mr. J. A. Smale, B.Sc., M.I.E.E., and Mr. N. C. Chapling, Chairman, Chief Engineer and Traffic Manager respectively of Cable & Wireless, Ltd.; Dr. R. L. Smith-Rose, D.Sc., Ph.D., M.I.E.E., Director of Radio Research of the Department of Scientific and Industrial Research; and Brig. L. H. Harris, C.B.E., M.Sc., M.I.E.E., Controller of Post Office Research.

At intervals between the meetings, visits of inspection were paid to a number of places of Commonwealth telecommunications interest, such as Electra House, London, and the wireless stations at Rugby, Ongar, Cooling Marshes and Burnham Portishead, the Brent radio-telephone terminal and Overseas telephone exchange, and Dollis Hill Post Office Research Station. Visits of outstanding interest were also made by special invitation to the cable factory of the Telegraph Construction & Maintenance Co., Ltd., at Greenwich, and to the Cable & Wireless, Ltd., cable relay station and training school at Porthcurno. A reception by the Rt. Hon. Ness Edwards, H.M. Postmaster General, concluded the proceedings.

United Nations Tariff Conference in Torquay

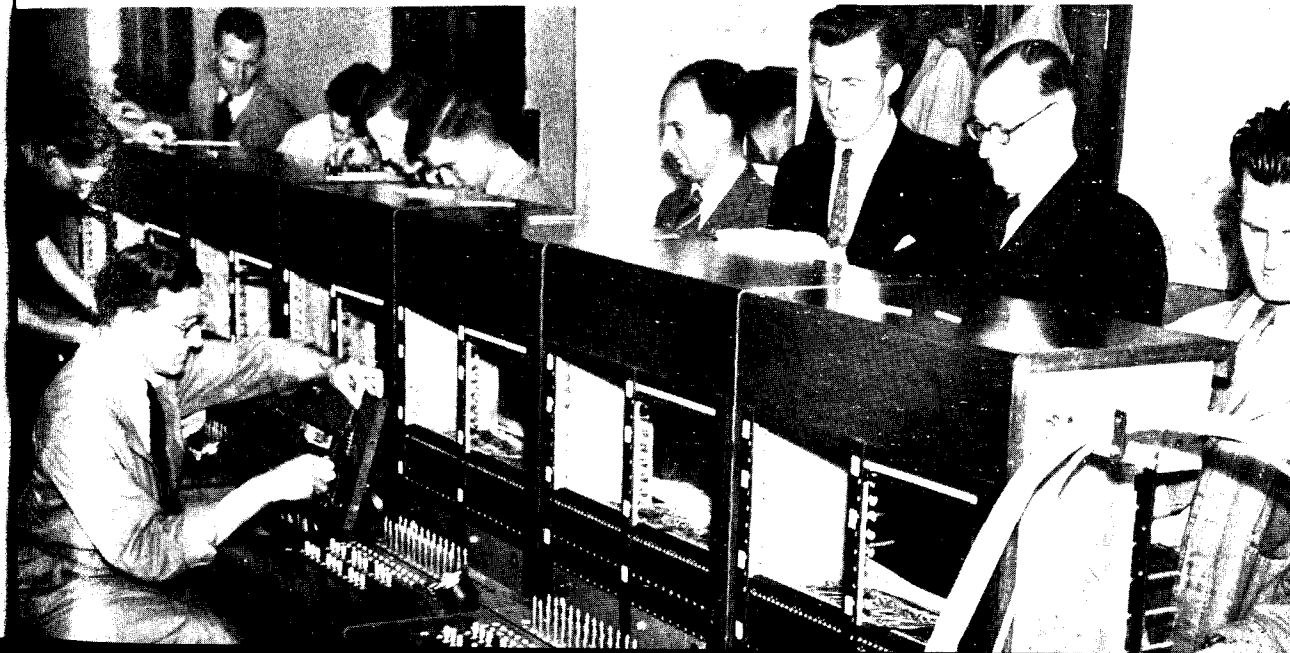
by G. A. TICKNER, Head Postmaster, Torquay,
and H. G. Dean, Telephone Manager, Exeter.

UNDER THE HAVANA CHARTER, THE United Nations in 1947 set up an Interim Commission charged with the task of instituting a permanent specialised agency—The International Trade Organisation (I.T.O.)—to plan for peace and plenty. While awaiting the full development of I.T.O., steps were taken at Geneva later that year to lower tariff barriers affecting certain commodities, when 23 nations, responsible between them for nearly two-thirds of world trade, signed a General Agreement on Tariffs and Trade (G.A.T.T.). The scope of the Agreement was widened in 1949 at a meeting of

the contracting parties at Annecy in France, and further extended tariff negotiations were due to take place in September, 1950. The British Government urged upon the Interim Commission for the International Trade Organisation (I.C.I.T.O.) the claims of Torquay, Queen of the English Riviera, as an ideal venue for the gathering, and in December, 1949, Post Office people in the West Country first made acquaintance with the now familiar initials G.A.T.T., when the authors were asked to advise the Foreign Office on postal and telecommunications arrangements for a Tariff Conference at Torquay.

The Conference switchboard under construction

(By courtesy of the "South Devon Journal")





By courtesy of the "Western Morning News"

The Mayor welcomes the Delegates. On his left, the Conference Chairman, the Hon. L. Dana Wilgress, Canada; on his right, the Rt. Hon. Harold Wilson, O.B.E., M.P., President of the Board of Trade

Conference Requirements

This was to be no ordinary conference, of the kind that seaside resorts are able to take in their stride. It would begin in September, 1950, and continue for 4 or 5 months. Some 1,200 delegates would be attending. A conference hall for plenary meetings was required, capable of accommodating 300 persons, with a dozen committee rooms within easy access of a centrally placed Secretariat office. Each of the delegations would want office accommodation, amounting to about

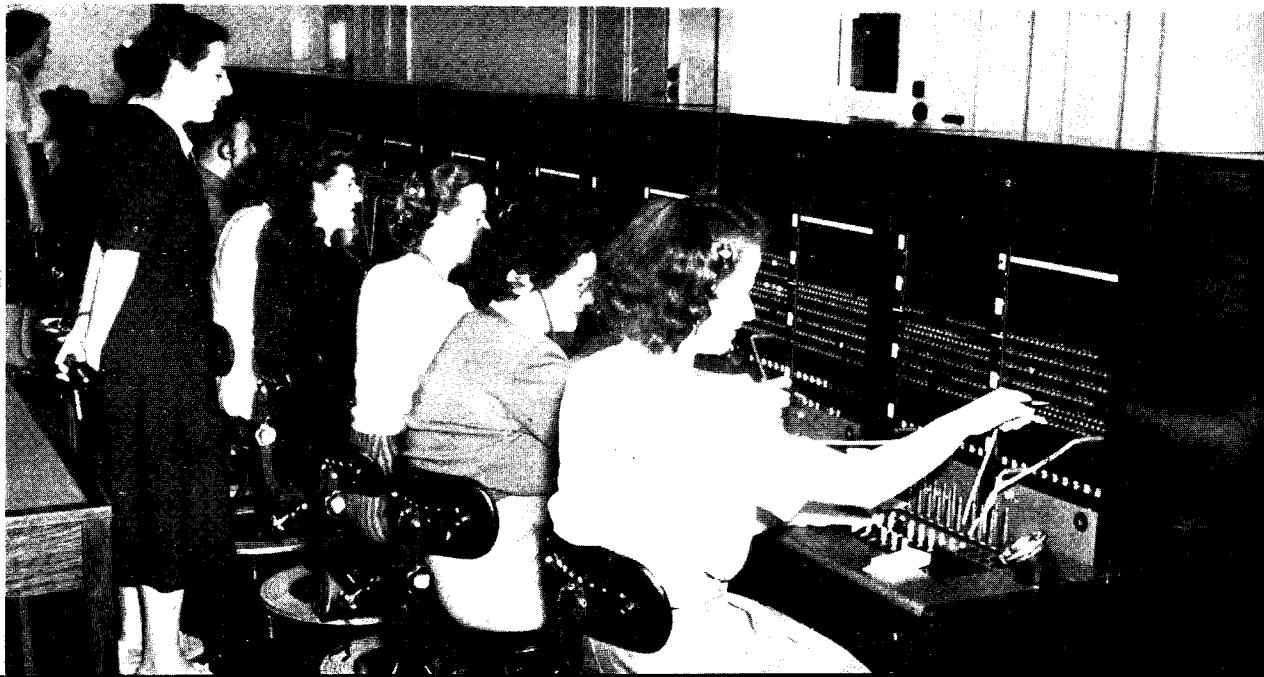
350 rooms. The Secretariat would need some 15 offices, facilities for the reproduction of documents, an Information Centre and a Press Office. A delegates' lounge, capable of seating 150 persons, had to be envisaged and finally there was the problem of first-class hotel accommodation involving at least 1,000 rooms.

An essential requirement was that there should be full telephone inter-communication between the Secretariat and all the delegation offices, with operating staff capable of speaking English, French and Spanish; a Post Office with full postal facilities; and rapid telegraphic and telephonic communication to all parts of the world.

Meeting I.C.I.T.O.'s Demands

The Torquay Town Council, with the then Mayor, Ald. F. J. March, J.P., gave every possible assistance to ensure the successful accommodation of the Tariff Conference. The Marine Spa ballroom with its splendid lounge, occupying a position on a promontory washed by the waters of Torbay, was selected for plenary meetings. Since this building was to be also the social centre, it seemed the ideal place for the Branch Post Office. There is a concentration of first-class hotels on the promontory, and it was clear that if some of these were selected for use as delegation and Secretariat offices, a Conference campus, easily isolated for security purposes, could be created near the Marine Spa. Un-

The Conference switchboard, staffed by linguist telephonists



World press representatives at work in the Marine Spa ballroom, which was later used also as a Delegates' Lounge. Suites of call offices can be seen at the far end

fortunately, this part of Torquay had not been heavily telephoned. The capacity of the special Telephone Exchange was estimated at about 600 lines. It would serve the Secretariat, Conference rooms and all delegation offices and be located in the Secretariat building. The Conference Post Office with telegraph facilities would be at the Marine Spa, readily accessible to delegates attending Plenary Sessions or enjoying the amenities of the delegates' lounge.

The Post Office was given less than 7 months in which to do its work. This consisted of planning and providing an extended local line network connecting the hotels and other units in the Conference area, the building of a Conference exchange, linking it with the Torquay trunk exchange and supplementing both trunk and telegraph communication channels between Torquay and London. Planning and preparatory work, such as the earmarking of equipment, was put in hand before final decisions were made about the location of the Conference at Torquay, so that it was possible to place a contract and commence the ductwork within a fortnight.

Difficulties of Combining Business with Pleasure

During the season, Torquay accommodates some 60,000 holidaymakers each week. The town is

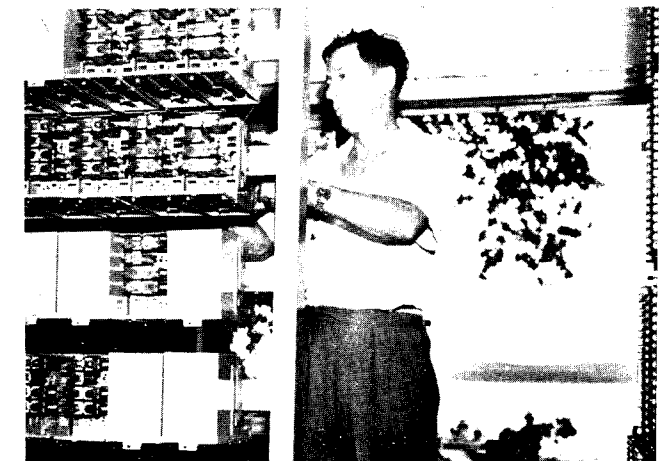
always crowded at Easter and the summer season lasts from Whitsun until late September. No less than 3,060 yards of duct had to be laid and 8 manholes and 54 jointing chambers built. The work had to be concentrated into March, April and May. Owing to the impossibility of working in the main shopping streets of Torquay during the Easter holidays, all excavation had to be closed down for 2 weeks at that time.

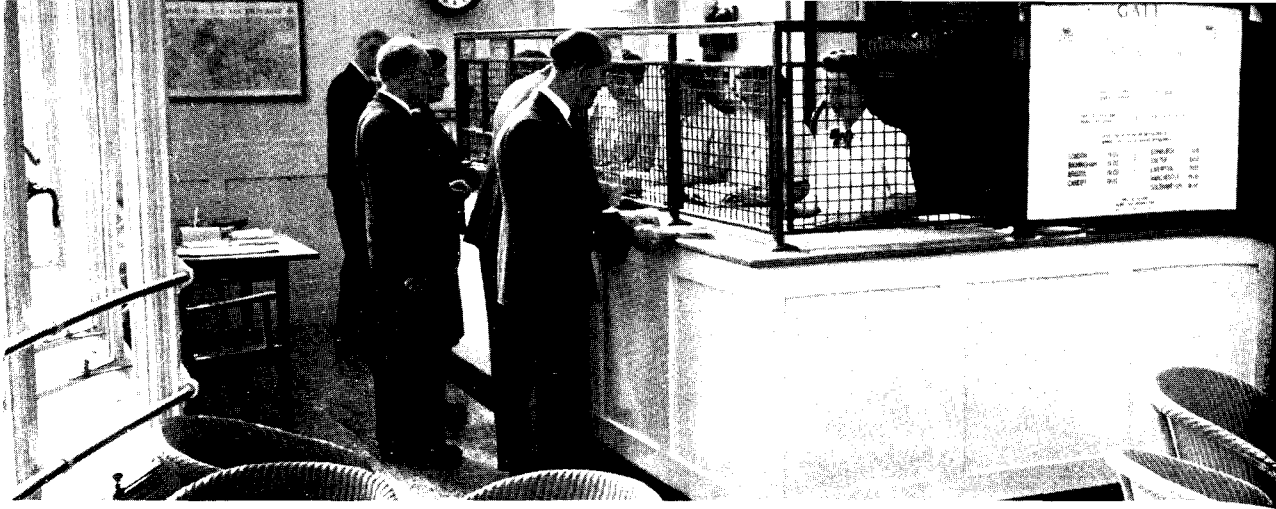
Planning Communications

Planning of the communication arrangements

Subscribers' calling equipment in the Conference Exchange apparatus room, overlooking Torbay

By courtesy of the "South Devon Journal"





The Conference Branch Post Office counter in the Sun Lounge, Marine Spa, directly overlooking the sea

had to be based broadly on the number of rooms per hotel. Flexibility was introduced by the use of the main distribution frame at the Conference exchange and the provision of 3 cross-connection cabinets. The drawing-in and jointing of the main cables immediately followed completion of the ductwork. A total of $4\frac{1}{2}$ miles of cable of varying sizes up to 1,000 pairs (amounting in all to 1,200 pair-miles) was pulled in and jointed. The chief problems affecting the Conference P.B.X. were the probable traffic capacity of the switchboard and the location of the switchroom. There was no precedent installation in this country on which either the calling rate per line or the operating call value could be based. We were told that the work of the delegations would be conducted chiefly by numerous small committees engaged in the hard bargaining of tariff reductions, with occasional larger plenary meetings at which progress would be reported. This suggested that the telephone user habits of the delegates might follow closely those of large commercial offices, with a high degree of inter-communication between delegations and heavy long-distance telegraph and trunk communication with London Embassies and parent Governments abroad. After consultation with London Centre Area as to the traffic characteristics of some of the large Government P.M.B.X.'s, it was decided that 12 operating positions would give a safety margin and that the switchroom should be capable of accommodating a further 3 positions. The type of equipment selected was P.M.B.X. 1A, a C.B. lamp-

signalling sleeve-control switchboard with answering in the multiple field and through clearing. In the light of subsequent information, the switchboard was equipped for 500 extension lines and 100 exchange lines. The Conference exchange was given the distinctive number "Torquay 8000". In addition, as 20 incoming lines would be required, an "11 and over" type P.B.X. Final Selector Unit was provided at Torquay Automatic Exchange. The work of building the Conference P.M.B.X. in the Princes Hotel and providing the 1,000-pair cable lead-in began at the end of May. The engineering work in the hotel was carried on throughout the summer as unobtrusively as possible, without causing inconvenience to visitors. Although the winter trunk traffic at Torquay is much below the summer peak, it was thought prudent to strengthen the outgoing and incoming groups of trunk lines to London. To ensure speedy connection, the generator-signalling trunk route from Torquay to London was converted to direct voice-frequency dialling. This was achieved by a new system which utilises a voice-frequency telegraph channel for the dialling path. The additional voice-frequency telegraph channels were provided at Torquay and in London by means of mobile equipment mounted in trailers. Area staff installed trunk dialling conversion equipment to a new design furnished by the Engineering Department. They also equipped the Torquay demand trunk positions with the new type of dial No. 14

1A 2 VF, fitted with director dial plates. Time did not permit a field trial of the new equipment, but it has given every satisfaction. The summer season was in full swing when the Post Office engineers faced the job of cabling the Conference hotels. With the willing co-operation of hotel managements, a "Blitzkrieg" technique was adopted. The maximum number of men were concentrated on one hotel floor at a time. Disturbance was thus reduced to a minimum. The date set for the arrival of delegates to the Conference (Monday, 18th September) was also fixed as the date for opening the Conference exchange. The 16 hotels taken over as delegation offices were in normal operation until Saturday, 16th September. When the last of the visitors departed, the Ministry of Works started removing the hotel furnishings and re-equipping the hotels with office furniture and appliances. The Area staff faced the considerable task of completing the wiring and installing 567 extension telephones between Saturday morning and 8 a.m. the following Monday. This they achieved by late on Sunday evening. Many of the residential hotels took the opportunity to improve and expand their telephone installations. More than 600 additional stations and 8 large P.B.X.'s were provided, so that at least 1,200 telephones were installed in Torquay for the Tariff Conference. Delegations expressed satisfaction with the service provided by the Conference P.B.X., and apart from a few direct lines installed for Heads of Delegations at their hotels, there were no requests for private installations. This is a testimony to the soundness of the decision to provide a central switchboard to serve all delegations.

Postal Facilities

A very attractive Public Counter was erected in the Sun Lounge of the Marine Spa. The waves lap against the rocks below and the view over Torbay from the Vita Glass windows of the Sun Lounge must be unrivalled for a Post Office. The office is staffed by officers with language qualifications. There is direct connection by teleprinter with the G.P.O. Cable and Wireless Section, Electra House, London, by means of which delegations are put in instant touch with the capitals of the world. Because of the worldwide ramifications of the Conference, arrangements had to be made to deal with telegraph traffic at all times of day and night. Credit

account facilities have been afforded to delegations for both postal and telegraph services. The Post Office has undertaken also, at special times, the collection and delivery of mail for Conference personnel. A suite of call offices under the control of an attendant at the Branch Post Office counter was placed in the Sun Lounge for the exclusive use of delegates. A separate suite of pre-payment kiosks was provided in the delegates' lounge, and the kiosk facilities throughout the town were considerably augmented. In addition, notices and instructions printed in German, Italian and Spanish were fitted in some 80 public kiosks in the Torbay area.

Information Service

The Foreign Office and the Torquay Corporation, in collaboration, published a handsome Conference Handbook which included information about telecommunications and postal facilities. In addition, a Conference Telephone Directory was put up in an attractive loose-leaf folder. By co-operation between the Senior Traffic Superintendent and the Conference registration staff, it was possible to include a list of delegations, their offices and enquiry numbers as a follow-on to the preface. From the time of their arrival, therefore, delegates could make telephone contact with each other, and before the Conference settled down to business they were provided with a complete nominal list of delegates and their telephone numbers.

Opening Ceremony

The Conference Opening Ceremony took place on Thursday, 28th September, under the Chairmanship of the Hon. L. Dana Wilgress, High Commissioner for Canada and leader of the Canadian Delegation. The Mayor of Torquay, Ald. T. F. Adams, J.P., and the Rt. Hon. Harold Wilson, O.B.E., M.P., President of the Board of Trade, welcomed delegates on behalf of town and nation, respectively. Delegates were later entertained at a cocktail party in the historic Torre Abbey. Since the opening date, Post Office arrangements have worked well. Not a little of this success is due to the collaboration of the Foreign Office Conference Department, the Ministry of Works, Lands and Accommodation Department, and the enthusiastic hard work of all sections of the Head Postmaster's office, Torquay, and the Exeter Telephone Area staff.



From left to right: C. D. S. G. ROBERTSON, Area Engineer; E. CHRESESON, Senior Sales Superintendent; H. JEFFS, A.M.I.E.E., Telephone Manager; A. J. CODLING, Senior Traffic Superintendent; A. L. FRISBY, Chief Clerk; W. H. BUCHANAN, Secretary.

BEDFORD TELEPHONE AREA

This Area covers the whole of Bedfordshire and parts of Bucks., Hants. and Herts.—a total of 865 square miles. Bedford is situated on the Ouse and has many historical associations, perhaps the best known being its link with John Bunyan. It is an important educational centre and its famous Grammar School was founded in 1552.

The Area, mainly agricultural, includes the town of Luton, formerly world-renowned as the centre of the straw hat trade and still famous for hats; but more important new industries in Luton are those concerned with the manufacture of motor vehicles, ball bearings etc. Other world-famous engineering firms exist at Bedford, which is also a centre for brick making.

The rapidly expanding Satellite Towns of Hemel Hempstead and Stevenage are in the Area and exceptional telephone growth is therefore expected soon.

The number of exchange lines at present is 26,586 and stations 48,174. There are 86 exchanges, of which 70 are automatic. Staff employed in the Area numbers 680.

LONDON TELECOMMUNICATIONS REGION—NORTH AREA

North Area (second largest in size in the L.T.R.) covers 246 square miles of North London, stretching from Hackney in the south to Harpenden in the north, and includes the well known Welwyn Garden City and the City of St. Albans, which celebrated its millenary in 1949. Among its more important subscribers are the B.B.C. Television Studios at Alexandra Palace and the De Havilland Aircraft Co., Ltd., at Hatfield.

There are 128,000 exchange lines in the Area, connected to 37 exchanges, of which 29 are automatic. The total staff numbers approximately 3,200.

From left to right: E. M. STONEBANKS, M.B.E., A.M.I.E.E., Area Engineer; W. T. WOODING, A.M.I.E.E., Area Engineer; E. M. GLEADLE-RICHARDS, B.Sc., A.C.G.I., M.I.E.E., Area Engineer; J. LENNOX, Telephone Manager; Miss A. M. AVERY, Chief Clerk; L. FRANKS, Chief Sales Superintendent; R. C. ATKINS, Chief Traffic Superintendent.



Another Year's Progress

★ ★ ★

The following article gives a survey of Post Office achievements in the sphere of telecommunications during the year 1949-50. For more detailed comparison with the work of 1948-49, readers are referred to the survey which appeared in our issue of November, 1949, under the title "Still Going Ahead".

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AT THE END OF MARCH, 1950, 3,032,000 exchange lines (including 107,000 lines shared by two subscribers) were connected to Post Office exchanges, while the number of telephone stations had risen to 5,171,500, representing net increases of 80,000 lines and 252,000 stations during the financial year. The gross number of new subscribers' connections (including shared service) provided during the same period was 312,000, while the number of subscribers' telephones installed was 524,000 (64% of these being in business premises). This rate is not so high as in the peak post-war year but is nevertheless appreciably higher than in any pre-war year. A further 2,474 public telephone kiosks were brought into service during the same period and service was provided for an additional 12,500 farmers.

The gross demand for telephone service remained fairly steady, though there was a small reduction in net demand as a result of earlier applicants not accepting service when offered. The provision of telephone service slightly exceeded the rate of net demand, so that between March, 1949, and March, 1950, the waiting list was reduced from 510,000 to 483,000 (excluding applications in the course of being met).

In accordance with the 1949 Budget, the charge for local (untimed) calls was increased from 1d. (plus 15% surcharge) to 1½d. per unit. This increase has had no noticeable effect on the calling rate.

1. THE TELEPHONE SERVICE IN 1949-50

The Engineering Programme.—The limiting factor in the development of the telephone service is no longer the physical shortage of materials, but the restriction of capital investment. This restriction seriously limits the size of the engineering works programme. When the Post Office investment figure for 1950-51 was actually decided, it was

clear that instead of providing for an increased engineering force, it would be sufficient to cover only a much reduced force. The Post Office was therefore compelled in October, 1949, to suspend the recruitment of engineering workmen—even those required to replace normal wastage—in order to avoid the possibility of subsequent dismissals of men.

Stores.—The stores position has continued to improve and the number of outstanding requisitions from Telephone Managers held by the Supplies Department was reduced during the year by over 30%. It is inevitable that, with 20,000 items of engineering stores and wide variations in the rates of supply and demand, some items should be out of stock from time to time, but in this respect pre-war conditions are being approached.

Equipment.—The continuing restriction of capital investment has continued to impede the programme for major conversions to automatic working. Despite this, however, 45 large exchanges with a total capacity of 79,500 lines were converted and 113 of the existing large exchanges were extended by 65,300 lines. In addition, 200 new small automatic exchanges were opened and a considerable number extended.

The exchanges converted to automatic working and brought into service during the year included three forming the Aberdeen non-director area with a total capacity of 16,300 lines. A further advance towards the ultimate conversion of Edinburgh to director working was also made by the opening there of a new director exchange of 7,000 lines. Other large exchanges opened were Metropolitan, Langham and Hayes (all in the London Telecommunications Region) and Boscombe; the total number of lines at these four exchanges is 28,100. In addition, the installation of the new automatic exchange at Chester, with

a capacity of 6,100 lines, was completed. Exchange works valued at some £4,500,000 were in course of installation. During the year, the total exchange capacity was increased from 3,379,000 to 3,572,000 lines and the margin of spare equipment from 11.2% to 11.9%.

Local Line Plant.—During the year, the subscribers' cable network was increased from 4,462,000 to 4,605,000 lines, but these were taken into use almost as rapidly as they were provided, and the percentage of spare lines remained stable at 24%. At the end of March, 1950, 134,000 cable distribution points, out of a total of 442,000 were still without any spare wires.

2. IMPROVEMENTS IN THE TELEPHONE SERVICE

Traffic and Quality of Service.—Trunk traffic continued to increase during 1949-50 and amounted to 235 million calls, representing an increase of 110% over the corresponding total for 1939 and 25% over that for 1945. Nevertheless, the Post Office is now giving a service which compares favourably with that given before the war and reflects a considerable improvement over war-time conditions. This is illustrated by the following figures, derived from regular observations of the quality of service:—

Average time to answer, in seconds:	Pre-war	1945	1950
Manual exchanges	6.0	12.0	8.1
Trunk and Toll exchanges	8.0	10.7	6.7
Long Distance calls only	5.0	17.0	6.0

It has been found necessary to keep in service a number of manual and automatic exchanges where the equipment is reaching the end of its useful economic life and would normally have been replaced but for financial restrictions. Nevertheless, the efforts that have been made to overtake war-time arrears of maintenance are showing results, particularly in director automatic exchanges. For example, the proportion of calls at these exchanges which fail to mature at the first attempt from causes within Post Office control is now 5.8%, compared with 9.0% in 1945 and 8.0% before the war. With non-director exchanges, the improvement has not been so marked; the percentage of calls which fail at the first attempt due to causes within Post Office control is 3.8% now, as against 2% pre-war, although shortage of equipment which has not yet been overcome in certain automatic areas is causing abnormally high figures to be recorded in those areas, and these are inflating the national average.

Telephone Exchange Staffing.—The year saw a continued increase in the proportion of permanent established officers amongst the telephonist force. At the end of March, 1950, 66% of a total telephonist force of 46,167 were established, compared with 60% and 50% at the corresponding dates in 1949 and 1948, respectively.

New supervising standards, designed to relate day and night supervision more closely to traffic requirements, were promulgated in February, 1950. The general effect will be to provide full-time day supervising officers at many of the smaller exchanges which at present are in the charge of supervising telephonists and, at night, to increase the proportion of substantive posts among the male supervising complement from the present figure of 20% to about 60%.

Telephonist Training.—Wing Training facilities are now available for all new recruits in London, with the possible exception, during periods of pressure, of some recruits for the London Trunk Exchange. In the Provinces, the proportion of new recruits trained at Wing Centres increased from 57.5% to 74.8%, while a further 21% were trained in organised exchange classes conducted as far as practicable on Wing lines.

Headquarters Traffic Training School.—Training courses for Traffic staff continued to be held throughout the year at the Headquarters Traffic Training School, and a total of 72 new entrants to the grade of Assistant Traffic Superintendent received initial training there. Detailed consideration was given to the initial training requirements of new entrants to the grade of Traffic Officer, to meet the large-scale resumption of recruitment to this grade expected during 1950-51.

Trunk and Toll Lines.—During the year, a further 778 circuits were added to the long distance public network, making a total of 16,340. Further steps were taken to exploit more fully the potential capacity of existing cables and the following 12-channel carrier systems were converted to 24-channel working:—London-Oxford, Birmingham - Oxford, London - Southampton, Bristol - Salisbury, Preston - Old Boston and Liverpool-Manchester. In addition, the Birmingham - Kidderminster - Old Boston coaxial system was restored to service after being re-equipped and the Bristol - Kidderminster coaxial system was brought into service with an initial capacity of 400 channels. The London-Salisbury coaxial cable was equipped to its maximum capacity of 600 channels, this being

the first coaxial system in this country to be equipped to this extent.

Television Extension.—Progress was made towards the extension of the television service. Television to the Midlands was opened via the Post Office London - Birmingham radio link on 17th December, 1949. Laying of the new London-Birmingham television cable was completed and it was brought into service in October, 1950. Arrangements were also made for extension to the proposed B.B.C. television transmitter at Holme Moss (near Holmfirth) by using the new coaxial cables being laid between Birmingham and Manchester and between Manchester and Sheffield. This is expected to be available in mid-1951. Preparatory work was carried out for the laying of a new submarine cable between Scotland and the Isle of Man, which should be ready for service in early 1951. A new 6-channel radio-telephone link between Alderney and Guernsey was opened on the 2nd December, 1949.

Advisory Services.—There was a notable development during the year of the service by which the Post Office provides advice to large users of telecommunications services as regards the scope and organisation of these services. Investigations have been carried out for the National Coal Board, Commissioners of Inland Revenue, Road Haulage Executive and others. Among aspects studied have been arrangements of extension telephones, training of private branch exchange operators, justification for automatic internal service, appointing of communications specialists and provision and utilisation of teleprinter circuits. A highly specialised example of this type of work has been in connection with the telephone service to ships in dock, carried out in

collaboration with representatives of dock owners and users.

Telephone Development Forecasting.—Re-deployment of staff and simplification of summarisation methods have resulted in an increase of about 40% in the number of exchanges for which forecasts were prepared during the year.

Kiosks.—During the year, 2,474 telephone kiosks (1,576 urban and 898 rural) have been installed and 932 obsolete kiosks replaced.

3. TELEPHONE PLANT DEVELOPMENTS.

Trunk and Toll Mechanisation.—The final report of a Working Party on Trunk Mechanisation was issued during the year, setting out suggested principles to be followed in planning an operator trunk dialling system.

The design of the equipment for London, which will be the first zone centre to be equipped for trunk tandem dialling, is well advanced, and orders will be placed in the year 1950-51 for two exchanges, each having capacity for 5,000 trunk circuits. A programme for the conversion, over a 10-year period, of all Zone and Group Centres is now being drawn up.

The new signalling system to be used on the longer audio circuits has been subjected to traffic trials with satisfactory results and, in addition, tests made during the year have shown that the multi-channel voice-frequency telegraph system can be used successfully as a telephone signalling system. On certain routes it will therefore be used to provide dialling facilities before the new standard telephone dialling systems are available. **"999" Service.**—The emergency "999" service was further extended during 1949-50 to 356 of the smaller automatic exchanges. In the more remote communities dependent on a distant town for emergency services, the value of the

TYPICAL FIGURES SHOWING PROGRESS THROUGH THE YEARS 1938-50

March 31st	Total Number of Stations	Total Number of Exchange Lines	Additional Telephones provided per annum (excluding transfers)	Total Number of Shared Service Subscribers	Percentage of Spare Pairs at Distribution Points	Percentage of Spare Exchange Plant
1938	3,050,000	1,930,000	395,500	172	33.6	9.8
1939	3,235,000	2,047,000	377,900	134	33.4	12.0
1940	3,339,000	2,061,000	410,100	117	35.0	17.0 (estimated)
1941	3,311,000	1,971,000	404,300	107	37.0	22.0 (estimated)
1942	3,316,000	1,994,000	451,200	205	38.0	24.0
1943	3,536,000	2,085,000	423,600	593	35.0	23.0
1944	3,764,000	2,179,000	400,200	1,547	33.0	22.0
1945	3,889,000	2,229,000	370,900	2,997	33.0	20.0
1946	3,937,000	2,336,000	428,400	5,252	29.0	17.0
1947	4,319,000	2,636,000	727,700	15,777	26.0	11.2
1948	4,653,000	2,836,000	607,100	62,962	24.0	9.9
1949	4,919,000	2,952,000	569,600	131,886	24.0	11.2
1950	5,171,500	3,032,000	625,000	214,004	24.0	12.3

POSTS OF TRUNK AND TOLL CALLS AND CIRCUITS

March 31st	Total Trunk and Toll Calls	Total Trunk and Toll Circuits
1938	106 millions	6,131
1939	112 ..	6,770
1940	117 ..	6,220
1941	118 ..	6,400
1942	134 ..	6,715
1943	161 ..	7,676
1944	181 ..	8,173
1945	189 ..	9,430
1946	193 ..	11,882
1947	205 ..	13,333
1948	217 ..	14,528
1949	226 ..	15,562
1950	235 ..	16,340

STAFF TOTALS

March 31st	Total Telephonist Staff	Temporary Telephonist Staff
1938	27,981	4,021
1939	27,622	3,417
1940	28,526	5,288
1941	33,274	11,288
1942	34,466	13,655
1943	35,599	16,381
1944	35,798	16,691
1945	38,730	20,341
1946	43,214	25,056
1947	45,841	27,189
1948	48,212	25,098
1949	48,244	20,385
1950	48,443	16,440

"999" facility is not so great as in urban areas, for, although a few seconds can be saved in making contact with the emergency authorities, the time taken for police cars, ambulances and fire appliances to reach the caller's premises is often substantial. Furthermore, the areas concerned are usually outside the effective radius of police radio cars. However, the extension of the "999" service makes for uniformity of practice—very desirable in emergency—and is clearly a step which commends itself to the general public.

Speaking Clock.—Although present restrictions on capital investment do not permit a large-scale extension of this facility, it seems likely that provision at a number of towns, on or near the route followed by the "feed" lines can be arranged at small cost. An investigation into the possibilities was commenced during the year.

Shared Service.—During the year, the number of shared-service subscribers increased by over 80,000 to 214,000 at the end of March, 1950. In this period, the availability of separate metering for locally dialled calls was extended to all uni-selector and modern (2,000-type) line-finder exchanges. Trials of separate metering at Unit Automatic Exchanges and the older (pre-2,000 type) line-finder exchanges were successfully completed and it is now technically possible to provide separate metering at nearly all automatic exchanges. Shortage of equipment at some exchanges, however, will require shared-service subscribers to share a calling equipment, and in these cases joint accounting for local calls will remain as long as the shortage of equipment lasts.

Underground Work in Streets.—During the year, the Ministry of Transport consulted the Post Office about the preparation by that Ministry of a Bill for regulating underground work in streets. The purpose was to provide a comprehensive code to regulate the breaking up of

streets by all statutory undertakings (that is to say gas, water and electricity authorities as well as the Post Office) and to provide for the circumstances which arise when undertakings' apparatus in streets has to be moved or altered in consequence of road or bridge alterations or works of that kind. The Bill (which was introduced in Parliament in April, 1950, as the Public Utilities Street Works Bill) does not materially alter the existing powers of the Post Office for placing its plant in streets, but its provisions substantially affect the Post Office in regard to the procedure for carrying out works, for reinstatement arrangements and in the incidence of cost of removing or altering plant due to road works. A working party has been set up to examine the consequential changes in Post Office procedure and standing instructions.

4. THE TELEGRAPH SERVICE.

Traffic.—The number of inland telegrams, excluding railway and press telegrams, handled during the year was 41 million, compared with a war-time peak of 64 million and a pre-war level of 47 million. Traffic is still declining, but much more slowly than in earlier post-war years.

Quality of Service.—The average time that elapsed between handing-in a telegram and its receipt at the delivery office rose to more than 80 minutes during the war and it was still above 50 minutes in 1946. Considerable improvement has been made since then and the average time during the year under review was within 10 minutes of the pre-war time of 20 minutes. The average time to answer phonogram calls has generally been maintained at a satisfactory level; but the service in London has remained below the average, because of staffing difficulties.

Teleprinter Manual and Automatic Switching.—A further 85 offices were connected to the manual switching network during the year, bringing the

total number of offices served by the system to 266. The level of traffic now handled at a number of the switching centres is approaching the maximum for the switchboard positions at present available. Further expansion of the network will therefore be on a reduced scale. The improvement in the service arising from the introduction of switching has been maintained. The first stage of the automatic switching system was begun in the autumn of 1950.

Cable and Wireless.—During 1949, arrangements were made for all messages handed in at Post Offices in Southern and South-West England and in South Wales for transmission overseas by Cable and Wireless to be circulated direct to Electra House over the inland manual switching system. Incoming overseas traffic is also distributed to the same areas by this means. A speedier handling of messages has thus been achieved and it is hoped shortly to extend the scheme to cover the whole of the United Kingdom. The manual switching network has also been used to give an accelerated service on overseas traffic arising from special events, such as the annual conferences of the Labour Party and Trades Union Congress and the tours of the New Zealand and West Indies Cricket Teams.

Private Teleprinter Services.—There has been a steady demand. During the year, some 200 applications were received from commercial concerns for long-distance teleprinter private wires. About 1,600 such circuits are now in operation by private renters, in addition to some 900 circuits in service for civil Government Departments. An alternative telephone teleprinter broadcast network is being provided for Derby County Constabulary and an enquiry regarding a similar system has been received from Hertfordshire Police.

Phonograms.—The Newcastle automatic distribution and call queueing equipment was brought into operation in June, 1949. Observations have shown that incoming calls which do not meet queueing conditions are answered within one second. Calls which enter the queue because no operator is immediately available do not usually have to wait much longer than 10 to 15 seconds before they are answered. A study of the observation statistics indicates the desirability of more extensive field trials before a decision is taken whether to standardise this type of equipment for new phonogram rooms. It is proposed,

therefore, to convert a further 3 or 4 offices to this method of working during 1951-52.

Telegraph Staffing.—Recruitment difficulties have been experienced at one or two larger offices, but elsewhere staffing has been adequate. The position in London eased somewhat towards the end of the year. The number of inland telegrams was 3.3% less than the previous year, but more economical methods of handling resulted in a reduction of 4.5% in the number of telegraphists employed. A simplified technique for assessing staff requirements at larger offices has been developed to facilitate rapid adjustment of staff to changing traffic conditions.

Concentration of Telegraph Appointed Offices.—Economy in staffing smaller offices is being effected by concentrating phonogram work on fewer centres. The number of appointed offices for phonograms was reduced by 63 during the year and the process is continuing. A further 30 small appointed offices are scheduled to be closed. The residual traffic which has to be handled at these offices is small enough to enable teleprinters to be replaced by telephone telegram working, on which staff can be employed without extensive training. Following a general review, it is proposed to withdraw teleprinter working from about 100 offices where the traffic is small. The change will be made when staff savings can be shown; for example, when staff already trained ceases to be available to operate the teleprinter.

Telegraph Training.—The number of telegraphists trained during 1949-50 was approximately 1,750, but the rate of intake decreased during the latter part of the year. The training scheme has been under continuous review, with the object of effecting improvements, and it has been decided to reduce the overall length of the course to 18 weeks, the more advanced trainees being released from the 15th week onwards. To improve the quality of telegraph supervision, training courses have been given at 11 centres throughout the country to 1,700 supervising officers. It is early yet to assess the results of these courses, but there is little doubt that the outcome will be beneficial to the service.

Telegraph Delivery.—In London and Birmingham and certain other large centres, schemes are in hand to effect staff saving by concentrating delivery on fewer offices, using motor cycles. Motor-cycle delivery is now in operation at a total of 199 offices, employing 928 machines, as

compared with 40 offices and 273 machines in 1939. A new light-weight motor cycle of 125 c.c. has been introduced in some areas and this will probably be adopted as standard. Concentration on Crown Offices of Sunday delivery for Scale Payment areas has relieved about 20% of the offices of Sunday attendance and a modest reduction in cost has been secured.

5. THE FUTURE

The most difficult problem facing the telephone service is finance. The position is that while the telephone service is about half as large again as before the war, and while demand for telephone service is substantially higher, the capital now available for development and extension of the service is less, allowing for increases in the prices of materials. The capital available for

development of the telephone service in 1950-51 is about 2% less than in 1949-50. The original plan for 1949-50 and subsequent years was framed on the basis of steady development and an increase in the engineering force of about 3,000 men each year until the arrears had been overtaken; but, as outlined above, the Post Office in 1950-51 will be operating with a reduced engineering labour force, because of the limits on capital investment; and to the claims for normal development of the service are now being added the increasing requirements of the defence programme. In these conditions, the limited resources of finance, material and manpower will be utilised in the manner best calculated to further the development of the service in the national interest.

Quartz Crystal Clocks

by H. T. Mitchell, M.I.E.E.,

Engineer-in-Chief's Office

MOST PEOPLE ARE FASCINATED BY clocks. The turret clocks of our large buildings, the grandfather clocks of the Victorian era or the modern alarm clock with its uncanny persistence, all are of interest. More recently a new type of clock which surpasses in accuracy all its predecessors and which is showing up irregularities in the period of rotation of the earth—our fundamental time-keeper—has been developed by radio engineers. This new clock is known as the "quartz clock" and has evolved as a by-product from work in the development over the past 20 years of radio-frequency oscillators of higher and higher precision.

Quartz is a natural crystal of silicon oxide and occurs fairly freely in nature. Good crystals have rather remarkable properties and bars or plates cut from these have almost perfect elasticity and vibrate with very little internal loss. Quartz has, however, another remarkable property; it is what is known as piezo-electric, that is to say that if mechanical force be applied to a piece of quartz cut in an appropriate manner, the quartz will acquire a difference of electric potential between different faces and, conversely, if electric pressure be applied between different

parts of a quartz bar, mechanical deformation will occur. These properties enable a quartz bar to be used to control with very great precision the constancy of oscillations produced by a valve in an electrical circuit. The properties of quartz and the sizes of crystals in which it is available are such that it is most convenient and economical for this purpose to cut bars which produce oscillations somewhere in the range of from 50,000 to 200,000 beats a second. A few years ago, it became apparent that the time interval of one second, as determined from a quartz-controlled oscillator, of nominal frequency 100,000 c/s., by counting the time interval occupied by the oscillator in generating 100,000 consecutive cycles, was more constant than the "second" interval generated by the most precise form of pendulum clock. It was natural therefore for the astronomer, who is particularly interested in the accurate measurement of time, to use one of these oscillators in association with a counting mechanism as a time-keeper, and so the quartz clock has developed. With its help he has been able to increase appreciably the accuracy of his time service and this is of interest to many, for navigation, surveying, measurement of the force

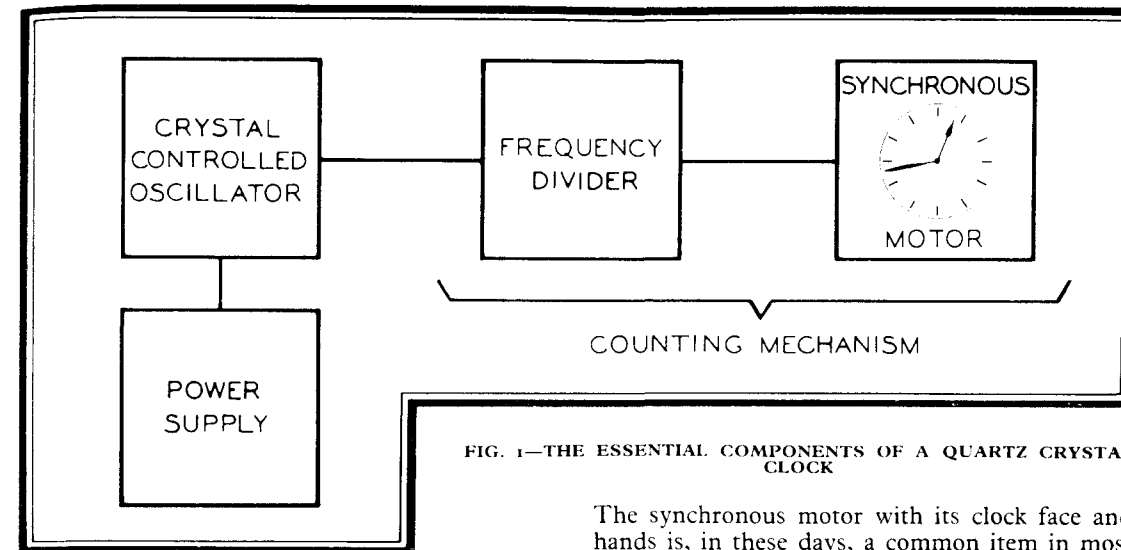


FIG. 1.—THE ESSENTIAL COMPONENTS OF A QUARTZ CRYSTAL CLOCK

of gravity and the setting up of efficient radio-communication networks.

The Engineering Department of the Post Office has maintained an accurate frequency standard for many years, because, both for line communication systems and for radio station operation, a precise knowledge of frequency is essential and the making of the highest precision quartz-clock installations for astronomers has come to be a very important by-product of this work.

Essential Features

The quartz crystal clock has four main components, as shown in Figure 1—a crystal-controlled oscillator, a synchronous motor to drive the hands on the clock face, a frequency divider for linking the vibrating crystal to the synchronous motor and some source of power for keeping the clock in operation.

The heart of the clock, the oscillator, is controlled by a small piece of quartz crystal; this pulsates 100,000 times per second and although it is a very high rate compared with the twice per second of the balance wheel of a watch, it performs exactly the same function, since it determines the rate at which the hands turn. The frequency divider, which changes the 100,000 cycles per second output of the oscillator to 50 cycles per second, is merely an electronic device for making the high-frequency output of the oscillator suitable for driving the low-frequency synchronous motor.

The synchronous motor with its clock face and hands is, in these days, a common item in most homes, where it is driven synchronously with the frequency of the electricity supply mains, usually 50 cycles per second in Europe and 60 cycles per second in America.

One of the most important features of a quartz clock and one which is not always given the attention it deserves is the source of the power supply. It is important because failure of the supply will cause the clock to stop. A battery is essential for any worth-while installation, so that the clock continues to function without interruption if the mains supply of electricity should fail.

Quartz Clocks for Astronomers

One of the many functions of astronomers is the determination of time by observation of the stars and the distribution of time signals to the public. For this purpose, they need clocks which can be used to bridge the gaps between the observations of the stars. These clocks must be very accurate, because the gaps between the stellar observations can, surprisingly enough, sometimes be many days. The accuracy of the best quartz clocks is now so great that time can be predicted by means of them to within 1/100 of a second over several weeks.

Small Quartz Clocks

Quartz clock installations of the type used by astronomers are very large, expensive and by no means transportable. Thus they are quite unsuitable for the many applications demanding good time keeping and portability. Ships and aircraft are two cases in which chronometers

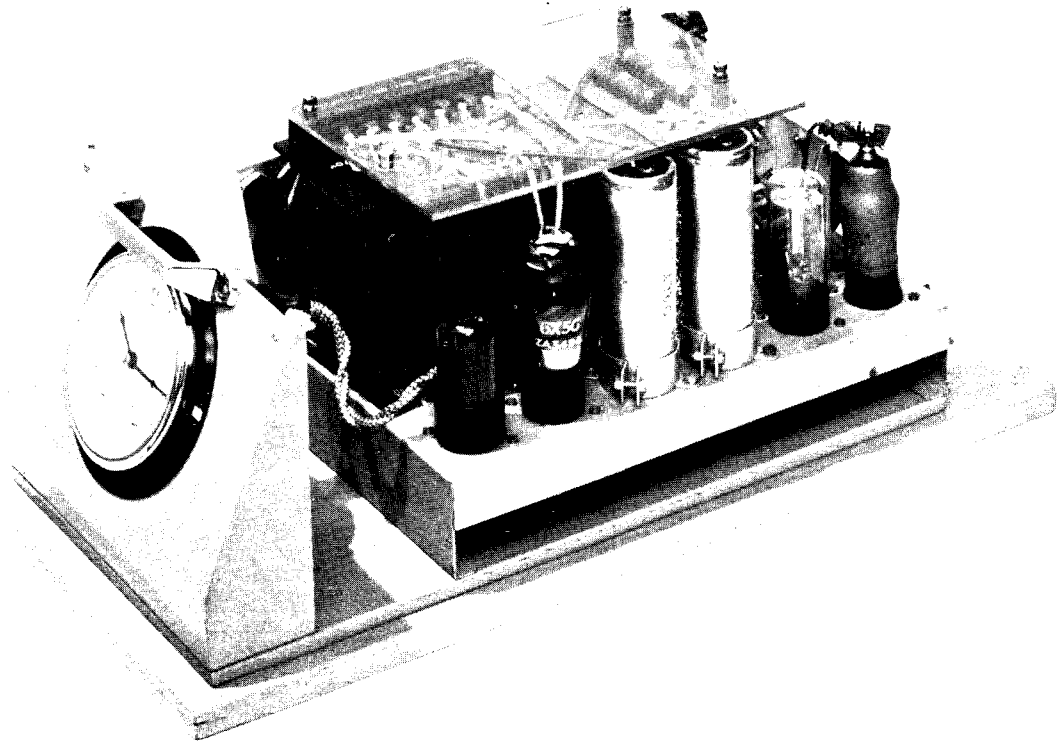
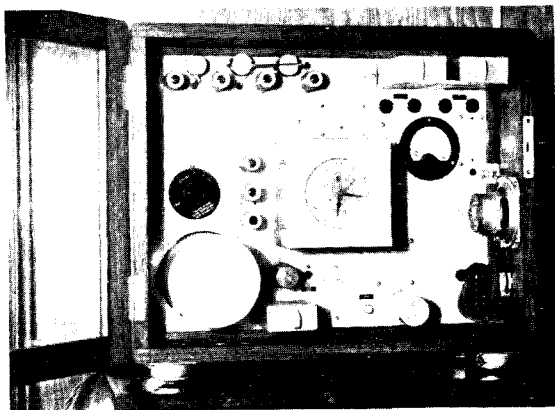


FIG. 2—SMALL MAINS-OPERATED QUARTZ CLOCK

(just a name for clocks of high accuracy) are required for navigation. The accuracy required is of the order of 1 second per week. Although this accuracy is many times less than that required by astronomers, it is difficult to obtain in a small transportable quartz clock.

A small mains-operated quartz crystal clock made in 1946 by the Post Office is shown in Figure 2. Its accuracy is 1 second per week under the temperate conditions experienced in a normal laboratory. Unfortunately, it requires the 50 cycles per second supply mains to be uninterrupted or it will stop.

More recently an experimental battery-operated quartz crystal clock has been developed and this is shown in Figure 3. This first experimental quartz chronometer was fitted in H.M.T.S. *Monarch* in April, 1950. It has several novel features; the crystal oscillator frequency has been reduced to 2,000 cycles per second and the complete unit operates from a 24-volt battery. While it is too early to say whether this form of chronometer will be used for navigational purposes, it can be said that the early results are encouraging.

left FIG. 3—BATTERY-OPERATED QUARTZ CHRONOMETER FOR H.M.T.S. *Monarch*

International Telex Service

In European telecommunications, telex service is defined as "The subscribers' telegraph service by start-stop apparatus". This, in more familiar terms, means a customer-to-customer teleprinter service, whereby subscribers are able to exchange typed messages directly with one another.

Before the late war, a telex service was available between this country and Holland, Belgium and Germany. At that time, it was operated over telephone circuits, similarly to the present inland telex system, and the charges were the same as for telephone calls, plus a rental for the hire of a teleprinter.

When the service was reopened in March, 1947, at first with the Netherlands, it had been agreed internationally to use voice-frequency telegraph channels, instead of telephone circuits, and the service on this basis is now available also with Belgium, Czechoslovakia, Denmark, France, Germany, Norway, Sweden and Switzerland, 28 circuits and 4 operating positions being used to handle the traffic of the 93 subscribers at present connected, all of whom are located in the London area.

No new subscribers have been connected for some time, as saturation point has been reached with the existing switchboard equipment, and although no publicity has been given to the service, there is a waiting list of some 200 would-be subscribers, including a few in provincial towns.

New equipment is expected to become available towards mid-1951 and, it is hoped, will enable service to be given to all the waiting applicants, but it will leave little or no margin for connection of further subscribers. There are certain tech-

nical difficulties to be overcome before the service can be extended to the provinces and expansion along those lines cannot be anticipated for some considerable time to come. It is intended, however, to make the service available to Austria, Finland and possibly Hungary within the next twelve months. Extension to New York over radio channels is a further development in view and is being examined from the technical aspect.

Some subscribers to the Continental service are also subscribers to the inland system and in these cases special switching equipment is provided in order that the same teleprinter can be used for the two services. The ultimate aim is, however, when the inland system is also operated on telegraph channels, to have a completely interconnected Continental and inland service.

For a telex call to the Continent, the charge is one half of that applicable to the relevant telephone call, with a minimum charge as for 3 minutes. In addition, a subscriber is required to rent a local circuit from his premises to the Continental telex board and a teleprinter. A "no-delay" service is generally provided.

The Continental telex service is formally recognised by the International Telecommunication Union in the Telegraph Regulations; and a C.C.I.T. Study Group is at present considering permanent Regulations for the operation of the service. At a recent meeting of the Study Group in Geneva, good progress was made with draft Regulations.

The popularity of telex can be gauged from the rapid growth of the traffic, which has increased by nearly 75% during the last twelve months.

Retirements from the Editorial Board

It is with great regret that the Editorial Board says goodbye to two people who have been connected with the Journal since its inception—Mr. J. H. Richardson, O.B.E., the Editor, and Mr. J. F. Murray, O.B.E.—who are retiring from the Post Office service. To both, the Journal owes much.

The Journal was most fortunate in having Mr. Richardson as Editor from the start: his wide knowledge of printing and editorial work have been invaluable in overcoming the difficulties inseparable from a new venture of this kind. Since then, he has done much to make it the success it is today, guiding it from the editorial and business point of view.

Mr. Murray, lately D.R.D., S.W. Region, had the onerous task of representing the Regional point of view—a task which he discharged with ability and a matter-of-fact charm, which made an admirable combination.

To both we give our warm thanks and best wishes for the future.



A Model Village at Notting Hill Gate

*by A. R. Iles, A.M.I.E.E.
Park Regional Training School*

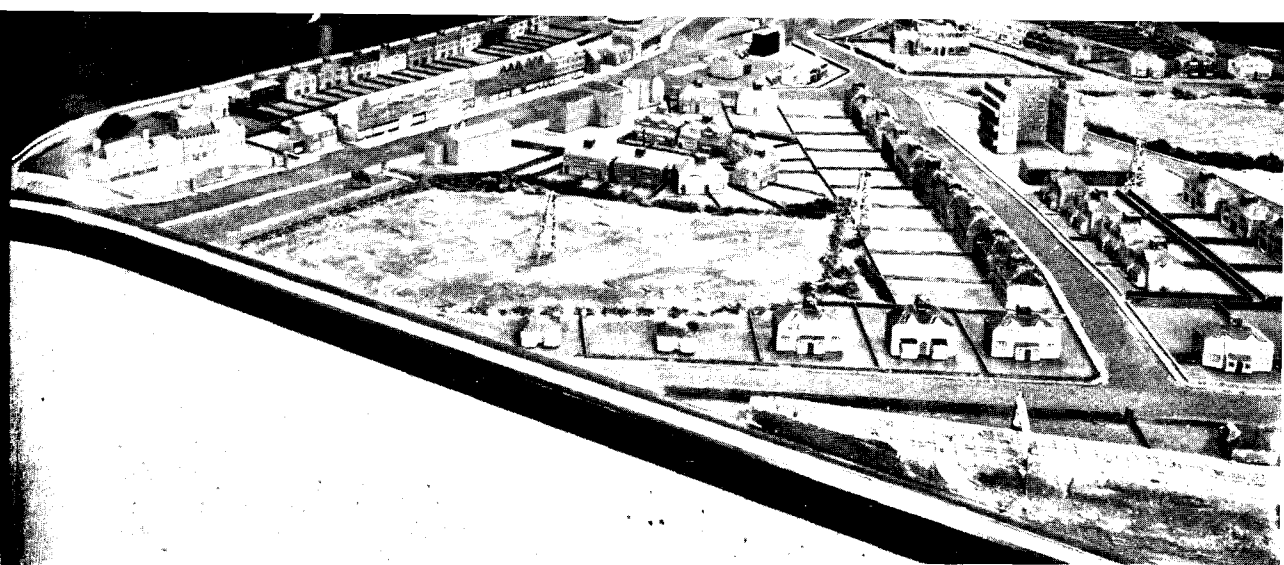
“Seeing is believing” is an adage which is taken advantage of in the teaching profession. It has been stated that 90% of learning is acquired through the medium of sight and this fact has largely been responsible for the visual training aids in schools.

In the course of my duties as lecturer at the London Regional Training Centre for Planning and Development, it occurred to me that a model of a suitable district would increase the students’ interest and enable them to visualise the practical considerations of this type of work. Careful choice of scale and height of mounting would

provide in effect the advantages of an aerial survey.

It was considered that a scale model of an actual locality covering about $\frac{1}{2} \cdot \frac{1}{4}$ mile would give a real appreciation of the work involved and that a scale of 25 feet to the mile would allow miniature telephone plant to be constructed, as well as confining the model to a size suitable for the room available.

Part of the Esher area was finally chosen, as with slight modification it could contain all the desirable features. A survey was made, including sketches of landmarks and prominent buildings,



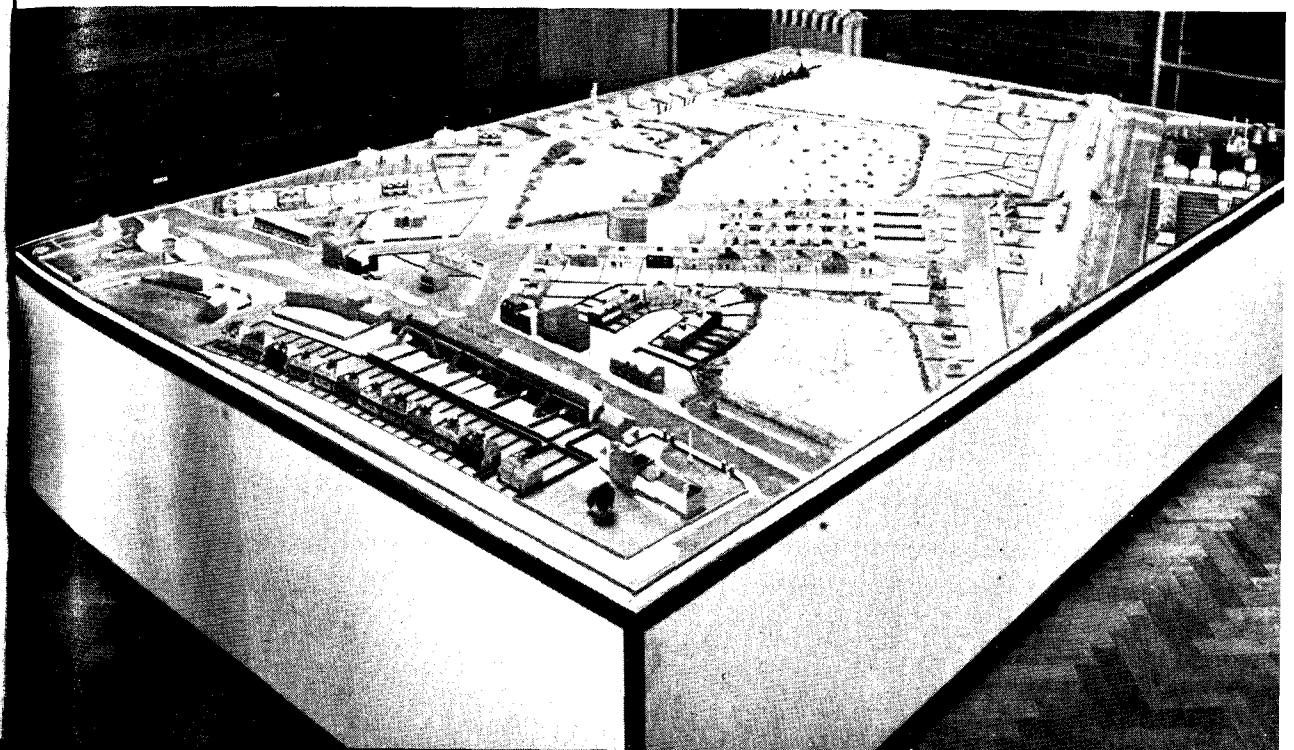
The Model

and the construction of the model on a base-board measuring 12 ft. by 8 ft. at a height of 33 ins. was placed in the hands of a very capable member of the school staff.

The major problem was the construction of buildings. After experiments had been made, it was found that casting Sirapite from lead moulds was satisfactory for standard types, but those with special characteristics, such as churches,

cinemas, banks and garages, needed individual attention. Miniature telephone plant to scale, consisting of distribution poles, joint-box covers, overhead wires and aerial cables, was then made. The realistic result shown in the photograph has been used in the training of Engineering, Sales and Drawing Office staffs and experience has shown that the provision of this model has been amply justified.

The Model Village, as seen from the left corner of the above photograph



Cable and Wireless Korea Unit

The following story of the adventures of the Cable and Wireless unit in Korea was originally broadcast by the B.B.C., to whom acknowledgments are made for permission to reproduce it here. The despatch was written by Rene Cutforth, a B.B.C. correspondent in Korea, and was sent through the station set up in the war zone by the Cable and Wireless Unit. It is reproduced as sent.

After four months of misadventure, British Cable and Wireless has established its station for sending news and personal telegrams back to the United Kingdom. Its story illustrates the experiences of many base units in this theatre of war. It was early in September that Cable and Wireless sent its eight thousand pounds' worth of equipment—six tons of it—by special plane from England to Hong Kong, and after weeks of waiting for shipping space and for permission to enter this theatre of war, it was set up in Taegu. At that time, the United Nations Forces were near the Yalu River, and the team of eleven wireless experts were not surprised when they were suddenly ordered to dismantle their set and take it to Pyongyang, three hundred miles north, which was then considered a safe base.

The ferocious Pyongyang road can shake the toughest equipment to pieces in a few hundred miles, so they decided to send the precious apparatus by sea, and accordingly two of the civilian experts, Mr. Pudner and Mr. Brown, embarked at Pusan on an Australian harbour vessel of a hundred tons with a crew of twenty-two Japanese.

Probably no-one but her famous Australian skipper, Mr. McArthur, would ever have tried to get the gear up to Chinampo, the port of Pyongyang, for she wasn't meant for sea voyage. The skipper's aids to navigation were some ancient charts and a simple compass, and the ship's company carried three rifles and a Bren gun. The ship wasn't heard of again for eight and a half days and was given up for lost.

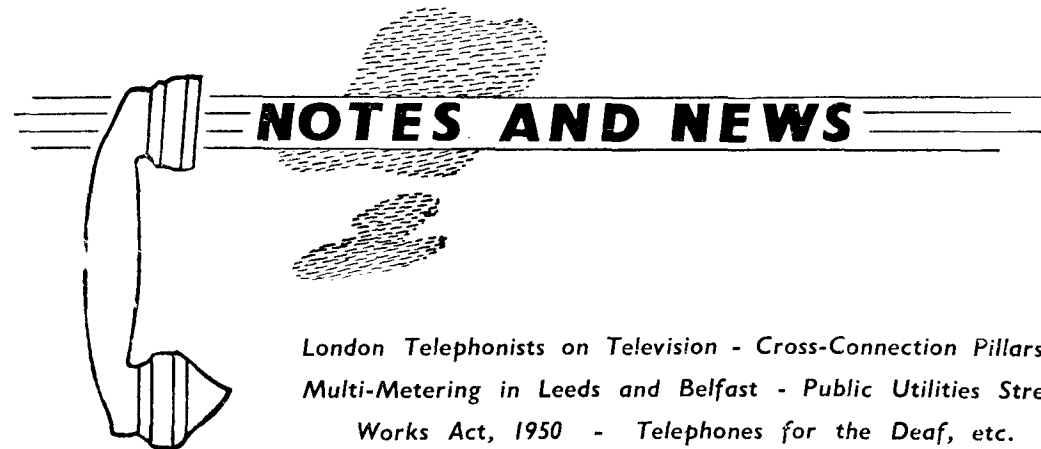
It was on the second day out, Mr. Pudner says, that they sighted the first floating mine, and, while skipper McArthur was firing at it with his rifle, another bobbed up right under the gunwale, and then for hours they dodged and twisted and fired their guns in a minefield. Every night they put ashore on some island, marching in with rifles to find out whether the population was friendly or not.

One night, when they were moored under the lee of an island, the anchor chain broke in heavy

seas, and in the morning—they kept no watch—they were miles out to sea in dirty weather. On that occasion, the ship nearly capsized, and there were no lifeboats. At seven o'clock one morning, they were ten miles from Chinampo, but in the heavy seas, they couldn't make port and had to turn and run for it. A naval frigate stood by to pick up survivors during this operation, but Mr. Pudner says he doesn't believe anyone would have survived in the cold of that sea. In mountainous waves, they ran for the lee of an island, and a destroyer came out to signal to them, but the waves blotted out the signal lamps which were trying to tell them that an air-sea rescue party was out looking for them.

Eight and a half days after their embarkation, the civilians crawled ashore at Chinampo. It was on that day that the Chinese began their offensive. Meanwhile, the manager with the rest of the party had arrived in Pyongyang by road. The manager had to make a quick decision. He decided that it was useless to unload the equipment. He ordered it back to Pusan in the same ship. As he and his land party stood on the bridge-head at Pyongyang on the night of the scramble out, he was handed what must have been the last cable ever received in that city. It was from his London office and, of course, days late. He read it by the light of the burning buildings. It was to this effect: "What are you doing? For Heaven's sake, get on the air".

The team's adventures on the journey back by road are too long to tell: how they took the wrong road and drove into a fight between South Koreans and guerillas; how the truck broke down; how they were rescued by a South Korean commander, who gave them a ceremonial breakfast of hot rice, wine and roast sucking pig; how finally they fell in with a rescue party, complete with doctors and mechanics, sent out to look for them; and how the skipper and his party fired on and boarded a junk on their way home, and how finally, on Christmas Eve, the station was completed and sent its first few messages.



London Telephonists on Television - Cross-Connection Pillars - Multi-Metering in Leeds and Belfast - Public Utilities Street Works Act, 1950 - Telephones for the Deaf, etc.

An Explanation to our Readers.—We feel that an apology is owing to our readers for the inordinate delay in producing our last issue.

This was largely due to a disturbance in the printing trade, which lasted several weeks. The accumulated arrears resulted in further delay, so that our forecast of "mid-December" (announced in the Post Office Circular) was not realised. Christmas was then upon us and we did not feel justified, as a Post Office publication, in adding to the burden of the mail services. Distribution was therefore deferred until immediately after the holidays.

Every effort is made to avoid falling behind schedule: apart from disappointment to readers, the work of getting out an overdue issue clashes with that of preparing the next one. That is why the copy now before you also failed to arrive on time.

Most of the leeway has now been made up and we hope that forthcoming issues will appear promptly.

★ ★ ★

London Telephonists on Television.—A number of trainees and telephonists were featured with Richard Dimpleby in a short item in the "London Town" series in the Television programme on the 8th December.

The programme commenced with the arrival of Richard Dimpleby at one of the London Wing Training Centres where he spent a few minutes listening to a class in progress. He then went on to visit Monarch Exchange, where he watched

telephonists who had passed through the training centres at work. He finally visited International Exchange, where he showed particular interest in the setting-up and timing of calls on radio links and concluded with a personal call to Stewart MacPherson in Minneapolis.

★ ★ ★

Cross-Connection Pillars.—Requests have been made by some local authorities for connection pillars located in public highways to be painted white and to have red reflectors fitted. Such modifications are not regarded as desirable. The natural colour of the pillars, which are off-white, makes them reasonably visible in the dark without painting. Moreover, the pillars are made of asbestos cement, which, owing to its chemical content, is injurious to paint, which if applied would have a short life and would soon become discoloured. Red reflectors might confuse motorists and lead to accidents, because the pillars are usually placed against the boundary wall at the back of the pavement, away from the kerb line.

★ ★ ★

Introduction of Multi-metering at Leeds and Belfast Exchanges.—On Sunday, 29th October, 1950, Leeds became the first large non-director exchange in the United Kingdom to have multi-metering facilities. Ten thousand subscribers in the centre of the city were given

access by code dialling to 46 exchanges within 15 miles radial distance. At the same time, exchanges with dialling-in facilities were given access to a further 17 exchanges, making a total of 41.

The traffic through the manual board fell by about 8,000 calls per day and a saving of 15 operators became possible. In addition, because of the reduction in the number of tickets to be dealt with by the Fees Section of the Telephone Manager's Office, a saving of two Clerical Assistants has been effected.

Belfast followed closely with the introduction of multi-metering facilities for over 7,000 subscribers at midnight on the 4th November; the resulting reduction in busy-hour traffic represents a saving of about 3½ positions.

★ ★ ★

Public Utilities Street Works Act, 1950.—

This Bill, the aims of which were described briefly in the August 1950 NOTES AND NEWS, has now become law. The Royal Assent was received on the 26th October, 1950. Generally, the new procedure will not take effect earlier than the 26th April, 1951, and this provides a welcome breathing space to those concerned in the revision and amplification of the multitudinous instructions affected by the provisions of the Act. The changes relate chiefly to underground plant.

★ ★ ★

Ventilation of Kiosks.—Suggestions are sometimes received for improving the ventilation of kiosks, e.g. by removal of one of the upper glass panels or of the cigarette holders, to discourage smoking. On the other hand, however, the user of a kiosk expects maximum quietness and to provide this all noises from outside must be excluded as far as practicable. Ventilation devices have thus to be limited to the slots at the top of the kiosk, i.e. alongside the panel marked "Telephone", and to a small opening below the door. It would be quite impracticable to prevent people from smoking in kiosks and the cigarette holders are provided not as an encouragement to smokers but to obviate damage to the fittings.

★ ★ ★

Festival of Britain and H.M.S. "Campania".

—As part of the Festival activities, this escort carrier will be used as a floating exhibition and will call at Southampton, Dundee, Newcastle-on-

Tyne, Plymouth, Bristol, Cardiff, Belfast, Birkenhead and Glasgow. The Tour will last from the beginning of May till the end of September, 1951. At each place, the exhibition will be open for about ten days or more. The ship will take about 2,000-3,000 visitors at one time and will probably attract an average of from 8,000-10,000 daily.

The Post Office has undertaken to provide and instal on the ship a telephone switchboard and 44 extension instruments. A flexible cable will be carried by the ship for connection to the public exchange system when the ship berths. The maintenance of this equipment will be the responsibility of the Post Office while the ship is berthed at any of the ports of call.

A call will also be made at Hull, but the Hull Corporation Telephone Department will provide the exchange facilities to the ship during its stay there.

A team of Post Office telephonists and a supervisor will operate the ship's telephone and public address systems. They will travel with the ship as part of the exhibition personnel.

★ ★ ★

Crossbar U.A.X.—A 40-line Unit Automatic Exchange of Swedish manufacture, using crossbar type equipment, is being installed in a small Government office in Battersea, where its behaviour in actual service can be studied. It will be used as a P.A.B.X., connection to the public network being effected via a standard switchboard. It is claimed that this type of equipment, in which mechanical movement has been much reduced in comparison with standard Post Office equipment, needs very little maintenance attention.

★ ★ ★

Life of Automatic Equipment.—A survey shows that five automatic exchanges still in service were installed well over thirty years ago, nineteen over twenty-five years ago and 177 over twenty years ago. The figures include satellite exchanges but not U.A.X.'s.

★ ★ ★

Burma.—At the invitation of the Burmese Government, a small team of Post Office specialists left London for Burma during the early part of December to prepare plans for the automatising of the Rangoon telephone system. It is hoped that the preparation of specifications by this team in standard Post Office form will result in the use of equipment of British manufacture.

Productivity in the Telephone Service.—

The view is widely held that, on the operating side of the telephone service, there is little scope for increased productivity. This arises, not from a false sense of perfection, but rather because telephone staffing is based on the apparently rigid standard of 200 unit calls per telephonist per hour. We must remember, however, that the unit values of calls can be, and are, changed; and also that only some 50% of the total staff is directly engaged on the connection of calls. Moreover, for a given number of calls, the standard of service given is just as much a measure of productivity as the number of calls handled, while there are many other factors not directly affecting subscribers but of importance within the Post Office. The following figures of Trunk calls per annum per Telephonist on the payroll are interesting:—

1935	6	3,850	1946	7	4,770
1938	9	4,480	1947	8	4,820
1940	1	3,700	1948	9	4,940
1942	3	4,840	1949	50	5,100

The figures show a pattern of progress, interrupted by the War but now resumed, in parallel with improved conditions of service.

★ ★ ★

Telephones for the Deaf.—For many years the Post Office has provided telephones fitted with an amplifying device having a manually-operated volume control. The telephone is self-contained and does away with any other hearing aid. The only drawback is that it cannot be carried about, but has to remain in position like any other telephone instrument.

To overcome this difficulty, the Post Office is experimenting with an adaptor designed for use with the Medresco hearing aid supplied under the National Health Service. In co-operation with the National Institute for the Deaf, a trial of six such adaptors by deaf telephone users was recently arranged. By the time this Journal appears, it will be known whether any further design work is necessary or whether the adaptor can be put in production.

★ ★ ★

Picture Transmission.—The Post Office has been asked to provide the Press with a 1,020-cycles frequency tone for synchronising the picture transmission equipment used on their rented private circuits. Although the Post Office standard tone is only 1,000 cycles, special equipment is being provided to meet the higher frequency required.

Though the equipment will be capable of giving the tone on four circuits only at any one time, any number of subscribers can be accommodated in successive batches of four. The proposed service will be limited to London and will be provided on rental terms. Renters will call Trunk Test on their ordinary telephone lines and ask for the tone to be put on the private circuit concerned.

★ ★ ★

Damage to Public Telephones.—Appeals have been made to the public to exercise greater care in using public telephone kiosks, and so help to avoid their being put out of service. Careless handling may cause damage to the instrument and render it useless. Public call offices are often the means by which the "999" emergency service is operated, and a telephone kiosk out of commission may, therefore, endanger life and property if the "999" facility is not immediately available. Damage is commonly caused by dropping the receiver or banging it down on to the cradle. Although telephones are made to withstand reasonable wear and tear, public co-operation is sought in preserving public telephones from damage.

★ ★ ★

Cheap Night Telephone Calls.—On October 7, 1950, the cheap rate period for trunk calls became 6.0 p.m. to 10.30 p.m., and was thus extended for ordinary subscribers from three to four and a half hours.

A cheap night rate has been in operation in this country since 1921, but reduced rates, with a maximum "shilling call", were introduced in 1934 to attract more telephone traffic to the period 7.0 p.m. to 5.0 a.m., when the expensive trunk lines were little used; during the first year, 17,000,000 calls were made at the cheap rate.

On the outbreak of war, the cheap rate was withdrawn, but it was re-introduced in 1940. In 1943, in face of staffing and other difficulties, the cheap period was reduced to 6.30 p.m. to 9.30 p.m. for ordinary subscribers, and 5.30 p.m. to 9.30 p.m. for coin-box users.

49,000,000 calls (20 per cent. of the total of 235,000,000 trunk calls) were made at the cheap rate last year.

The change unifies the starting time for both ordinary and coin-box users, and the extension from 9.30 p.m. to 10.30 p.m. enables cheap calls to be made after many of the evening entertainments have finished.

New Telephone Exchanges.—The Post Office is planning four new telephone exchanges to be built in the next seven years in the City Area of London. Two of these, which will serve the London Wall exchange and Avenue exchange areas, will be housed in a building to be erected on a site in Houndsditch. Sites for the other two exchanges, which are designed to give relief to the areas served by Monarch-Metropolitan and Central exchanges, have not yet been fixed.

* * *

Interference with Wireless Reception.—Under the Wireless Telegraphy Act, 1949, the Postmaster General may, after consulting an Advisory Committee, make regulations about electrical apparatus which causes interference to wireless reception. On July 26, the Postmaster General announced that he had appointed two such Advisory Committees; one to advise him about interference from the ignition systems of internal combustion engines, and the other about interference from refrigeration apparatus. These committees comprise experts and people who are in a position to express the views of those who are likely to be affected by such regulations as the Postmaster General may make on these matters. The committees have now to study the very complicated problems which are involved, and to give their views on the requirements which might be specified in the regulations.

Students and Visitors from Overseas.—In collaboration with the Colonial Office, the Post Office has given courses of training to students from Colonial and Foreign Postal and Telecommunications Administrations.

Programmes of study, covering the widest possible field and of varying periods, are drawn up for the students. At the beginning of September, 1950, 21 students were undergoing training in London and the Provinces. They included men and women from Nigeria, Malaya, the Gold Coast and Ceylon. In August, 1950, a student from the Nigerian Administration completed a three-year course. He was the first trainee to complete such a long-term programme.

In addition to these students, short-term visitors from many parts of the World are received at Post Office Headquarters. They come mainly from European Post, Telegraph and Telephone Administrations. In the past few months, however, Officials of the West German, Norwegian, Swedish, Dutch, Pakistan, South African and Iranian Administrations have visited Headquarters and, from there, have gone to various Regional Headquarters, Telephone Managers' and Head Postmasters' Offices to study the way in which postal and telecommunications problems are tackled in this country.

convinced and hold the view that the Post Office machinery is both too complicated and too restrictive. Perhaps we can allow the complications on the grounds that other large private and public bodies have systems no more efficient and no less involved, but it is the restrictive aspect of which we may be more critical. I feel the A.G.D., although close to the cause of our economics, may be remote from its effects. We must be careful, however, that prejudice does not tempt us to compare like with unlike, for we must grant that the Post Office is unto itself from many viewpoints. But it is Mr. Kuhl who makes the comparison with private business, so we may reasonably continue.

Restricting ourselves to the examination of three main aspects:—

1) *Flexibility*—Flexibility in financial matters can, I admit, be dangerous, but the lack of it to a reasonable degree, as with the close control of expenditure under watertight subheads, can give rise to inefficiency and frustration. At Area level these subheads become very narrowly defined, and this becomes very apparent, for example, to those responsible for the execution of engineering programmes. Provision of engineering plant is based on long term planning, and this can be seriously upset by short term financing. Also, towards the end of the financial year, we are often faced with the hurried transfer of labour from one class of work to another, inevitably leading to inefficiency and waste. Usually no money as a whole can be saved, as our labour force and stores—on a short term basis—are inelastic.

Being unable to rob Peter to pay Paul, we try to keep both Peter and Paul solvent by robbing John Bull—as the customer must inevitably pay for any inefficiency in the execution of our work. In fact, every March we are often much madder than the March Hare ever was, and I am sure that, in a similar position, private business, like Alice, would be no less astonished, and certainly much less tolerant.

2) *Vote Expenditure*.—There can be little quarrel with the raising of loan capital from the Treasury about every 3 years to finance development—this is normal business practice—although I am tempted to feel the Treasury is a place where they lend you an umbrella in fair weather and ask for it back again when it begins to rain! But why must we segregate our running expenses to be authorised yearly by a vote of Parliament?

It may be that this is the only parliamentary procedure that allows a censure of the Postmaster General's policy, but its effects are very restrictive.

A private business—or, perhaps a fairer comparison, a public joint stock company—raises additional capital by inviting the public to buy stock. Often this procedure is unnecessary, as a large concern usually has sufficient resources to finance normal development. This money not only covers capital requirements, but together with current revenue, allows for maintenance, salaries, wages and day to day running expenses. Certainly the company has to present to its stockholders an annual balance sheet, but no-one would suggest that the Board of Directors are restricted in the details of expenditure to the extent that is applied to the Post Office.

For example, expenditure on essential renewals has to be "voted" although we have a depreciation account, hypothetical or not, into which every year we have been transferring part of our revenue. Also, with the maintenance of plant where it might be more convenient and economical to defer certain work, one is prompted to spend to the limit of authorisation.

We are a profit-making (it may sometimes be a negative profit), revenue-earning Department, and with a 2-part tariff of charges it is usual business practice to consider the variable revenue (i.e. from calls) as covering our operating expenses, whereas the rental broadly covers our fixed charges. We ought thus to be able to finance at least our running expenses without the necessity for annual authorisation under "Vote". Short periods of financial authority such as this tend to instability, and lack of continuity in Departmental policy. Sufficient capital for about 3 years is authorised us under the P.O. & Telegraph (Money) Act—at least a similar period would appear to be desirable for Vote expenditure. On the other hand, a longer term may increase the difficulty of accurate estimating. We know the A.G. is critical of the ability of Departments to forecast expenditure with any precision and the Chancellor of the Exchequer is loth to accept Supplementary Estimates, but it may well be that what is now a matter of chance over a period of one year may become more a matter of certainty over a longer period. Certainly there is scope for further study of this question, using all the statistical tools now available to modern business.

Letters to the Editor

(In general, letters intended for publication should not exceed 450 words. Longer letters are occasionally acceptable, however, where justice cannot be done to the subject within such narrow limits. The following correspondence is a case in point.)

(1) *From P. E. Buck, Assistant Engineer,
Colchester Telephone Area*

The article on the principles and practice of Telecommunications Finance in the August Journal raises interesting and lively issues upon which, no doubt, it is incumbent upon all members of the Post Office to be well informed. Certainly we are all affected, either directly or indirectly, in some measure by P.O. financial practice, and with the present economic position, the article is well timed.

Mr. Kuhl's reference to George Bernard Shaw reminded me that G.B.S. also told the Intelligent Woman (and the not so intelligent male) that the Postmaster General actually boasts of his profits as a proof of Post Office business efficiency, but then goes forthwith and hands them over to the Chancellor of the Exchequer to keep down the Income Tax. Which, prima facie, looks rather unbusinesslike.

I make this point because the Author, in his article, is at pains to emphasise the identity of P.O. finance with outside practice, and backs this with illustrations neatly drawn from the field of private business. Mr. Kuhl appreciates that there may be some (here I feel he grossly underestimates current opinion) who are still un-

In the Exchequer's returns under Civil Votes the Post Office is grouped with the other revenue earning Departments, i.e., the Inland Revenue and the Customs and Excise. Both of these have purely tax collecting functions, they have nothing to sell and are not comparable with the business activity of the Post Office. This arrangement may be purely a technical method of presenting accounts but tends to suggest a common financial attitude to completely unlike organisations.

(3) *Profits*.—Our profits would appear to want some analysis before they can be accurately compared with those of a private business. In fact, in the manner in which they are now published, they tend to become an embarrassment rather than a matter of pride.

The public rarely interests itself in Post Office finance, and what it does read in the Press is promptly forgotten in the interval between the morning and evening newspapers. Forgotten, perhaps, except for this question of profit, of which they never cease to remind us when, as subscribers, they pay their accounts—or, as an example which most Engineers know, when we ask them to pay the cost of diverting a few overhead telephone wires so that they may fell a tree which is to the public danger. This, perhaps, may only illustrate the illogical sentiment of an ill-informed public towards such matters, but there is scope for presenting our profits in a more realistic manner.

The theory of supply and demand and its control over prices is rather upset nowadays with imperfect markets and National economic policy, but no doubt the time will come when even as a monopoly we shall be much more subject to the sovereignty of the consumer and our services and charges will have to be more closely related to what he demands and what he is prepared to pay.

A business concern would also put aside part of its operating profit to reserve, which, over a period of years, assists in equalising the effect of changing financial conditions. The Post Office Fund, which appears to have been liquidated in the 1939-40 financial year, might well serve this purpose.

Private business, in the presentation of its nett profits, makes due allowance for its tax liabilities. The Post Office, on the other hand, has no tax to pay and its profits therefore appear that much higher.

It would also be interesting to know how we

take into account the changing capital value of our plant and the provision for depreciation, as a result of the changing value of money. In the accounts of large public companies, one notes, from time to time, revaluations to place their capital on a more realistic basis. The recent Select Committee's report reveals that to cover the renewal of our plant at present-day prices we need to transfer to the Depreciation Account some £15m. more every year than we do now. On this basis, our profit, which, owing to other factors, has rapidly declined over the last five years, would now certainly be a negative one and suggests a businesslike review of our costs and tariffs.

In the same manner, in economics, in which we consider wages as the reward for labour, so we should represent profit as the reward for enterprise. Even in a monopoly such as the Post Office, it would be encouraging if our profit did, perhaps, represent rather more closely the foresight, judgment, yes, and courage of our management, rather than it be considered as a form of abstract accounting.

In conclusion, I would register my appreciation of such informative articles as those by Mr. Kuhl, but as the Wonderland of Telecommunications Finance is opened up before us, it appears to me, as Alice remarked, "Curiouser and curiouser!"

(II) *From T. A. Bateman, Asst. Telecomms. Controller, Midland Region.*

I have read the two articles on Telecommunications Finance by Mr. Kuhl in the February and August issues of the Telecommunications Journal with very great interest, and I am sure they will stimulate interest in the financial arrangements of the Post Office. The institution of Regional Control Accounts would also help people in the field to realise the influence they can exercise on the trend of the national Commercial Accounts, especially if some measure of Regional competition could be engendered.

I am sorry that in the first article Mr. Kuhl did not give the annual figures of revenue, expenditure and depreciation which led to the telephone surpluses and telegraph deficits during the last 20 years, as the reasons for the substantial variations would have been more apparent.

The marked variations in the telephone surplus must create many problems for the Administration, and it seems that the allowance for depreciation should not be based strictly on the "straight

line" method, but should be varied according to the gross trading profit and thus reduce the erratic variations in the net annual surplus.

I cannot agree with the statement in the second article that "There is nothing in this procedure

(Parliamentary control of Post Office expenditure) which differs in principle from that which would be followed by the owner of a business". The Vote and Loan expenditure procedure is entirely divorced from the revenue and it is only in the Commercial Accounts that revenue and expenditure are regarded as having any relation with each other. In an ordinary business, however, revenue and expenditure are considered as integral parts of the financial arrangements, and the trend of the revenue often gives an indication of the need for more (or less) expenditure.

The frequent emphasis on the Vote and Loan aspect of Post Office expenditure tends to distort the true picture as given in the Commercial Accounts. In fact, some restrictions on Vote expenditure, e.g. recovery of valuable surplus plant; limitation on manpower available for fitting new telephones where line plant and equipment are available, definitely reduce the revenue which could be earned, and thus have a detrimental effect on the Commercial Accounts.

Author's Rejoinder

From E. H. G. A. Kuhl, I.S.O.

former Deputy Comptroller and Accountant General

I am pleased that the two articles which have been published in the Journal have aroused sufficient interest to result in the letters which you have been good enough to let me see and comment upon. As indicated in my articles, I could not hope to carry readers with me one hundred per cent. and the letters naturally, therefore, challenge some of my conclusions. Mr. Buck's letter is particularly interesting and I will comment mainly on the points which he has raised.

The Analogy with Private Industry.—I am afraid I cannot agree that I emphasised the identity of Post Office finance with outside *practice*. I only claimed that they did not differ in *principle*. As regards detail, there are naturally differences, but that outside business suffers restrictions which it finds irksome is evidenced by frequent articles, comments or letters in the daily press and trade journals. Have we not all seen almost daily criticisms of the operations of the Investment Programmes Committee, the Capital Issues Committee and the various controls of primary materials such as steel, timber and cement?

Another point of difference in detail is, as I hoped to have made clear in my homely illustrations, that an individual owner of a business or, in larger concerns, the Board of Management exercises a restrictive control on the servants of the business just as irksome on an employee as operates in the Post Office, with this difference that those who do not conform with the policy laid down may suffer penalties even to the extent of dismissal.

Long-Term Planning and Financing.—With much of the spirit of what Mr. Buck says under this heading I am in complete agreement. Not only so, but in the February 1950 issue of the Journal the need for long-term budgets was emphasised and my critical view of a system of budgets limited to a period of one year was printed in italics. Further, I mentioned that as a first step towards a long-term view it has been arranged to call for a budget for two years instead of one and I mentioned that ultimately such a plan would need to cover a number of years. My own view is five years and in view of Mr. Buck's outlook I venture to hope he will agree that this is a reasonable period. If so, he would be surprised if he knew what a critical reception even this first mild step received from many colleagues in various departments of the Post Office.

However, granted such a system of long-term budgets, it is in my view necessary that there should nevertheless be an annual review, during which the plan will be extended one year as the first year falls out. In this connection Mr. Buck seems to have overlooked the fact that the Telegraph Money Act is not quite the blank cheque which he supposes as compared with the annual grant of Vote, because as I stated in the article the proposed annual capital expenditure still requires Treasury approval just as does the Vote portion of the Engineering Programme. I expect Mr. Buck will say "so much the worse for the system", but I venture to suggest that with long-term financial planning, which is Government policy, subject to annual reviews, since no business ought to put itself in a strait jacket for some five years, we should obtain a greater measure of stability than obtains under a short-term outlook.

Flexibility in Accounting.—There is, however, one condition to the attainment of this stability so far as it is within the control of the Post Office and that condition is that the plan must be a well-conceived one based on as large a measure

of detailed analysis as possible, changing circumstances being allowed for in the annual reviews. In the field of their own technical operations, engineers recognise this need and as far as I am aware all recognise in this sphere the need for fundamental plans of exchange area layouts for twenty years ahead, but in my experience there is much less recognition of a similar need in connection with financial planning. At its worst, this spirit expresses itself in advocating the adequacy of global figures. This in my view is the negation of planning. Soundly based budgets are an essential to long-term financial planning and with these together with reliable forecasts Parliamentary Estimates procedure loses much of its terrors. Now as regards points of detail. The Accountant General's Department has never insisted on keeping the thirty or so Classes of Works in watertight compartments. I myself made this clear to some 400 Regional and Area staffs in conferences I had with them about two years ago. There must, of course, be limitations on the flexibility which is permissible. First, the balance between the different types of plant provision must not be seriously disturbed. For example, it would not be good policy to concentrate staff on the provision of subscribers' circuits (in spite of the revenue this would bring in) to an extent which would rapidly produce a situation when no more spare line plant and exchange equipment was available to future essential subscribers. This answers one of Mr. Bateman's points. Secondly, there should be no serious departure from the total allotment for Loan and Vote respectively.

There are two further points of detail on which it is desirable to comment. Mr. Buck speaks of the labour force being inelastic and says that an overall excess as a whole cannot result from this source. This is true if Regions and Areas do not exceed their labour allotment; but in a recent year recruitment very considerably exceeded the allotment, thus causing trouble in the direction of Supplementary Estimates. Secondly, he draws attention to the expedients which have sometimes been adopted in March to prevent excesses. Here, I can only say that they result from unreliable local forecasts, to the tune of differences of £1,000,000 or £2,000,000 within a few weeks of one another, which necessitate the special steps often taken at the end of the year when actual records of expenditure show the forecasts to be incorrect. This underlines the need for sound

forecasts which I have emphasised, whereas the previous point shows the importance which I have also stressed of having a soundly based engineering programme and sticking to it. In short, the remedy and possibility of preventing uneconomic adjustments are within local powers of action. Before leaving the subject of Vote and Loan, it is convenient to deal with a point raised by Mr. Bateman. He says this is divorced from revenue and that it is only in the Commercial Accounts that revenue and expenditure are brought into relation with one another. This is perfectly true and I made the reason for this clear when I showed how £23½ million of capital expenditure earned the Post Office £2½ million revenue for say 20 years. For some mysterious reason he thinks that private business works on a different basis. In fact, they also have a cash accounting system, the details of which are translated into Commercial Account form, and Capital (i.e., Loan) subscribed by the Public or provided out of a General Reserve Fund, would be accounted for as such in the cash accounts and the annual charges—Interest and Depreciation—only would be shown as *expenditure* in the Commercial Accounts.

Profits.—Space prevents me from commenting on all the interesting points which Mr. Buck raises under this head. In regard to the problem of the changing capital value of our plant, I should like to refer him to the end of the penultimate paragraph of my article in the February 1950 issue of the Journal, in which I state that the Post Office is making provision in the Depreciation Account for the excess cost of renewals as they are being effected and in addition is making a small advance provision in respect of future renewals. I also state that the accounting world has not yet come to an agreed answer to this problem. There are those who argue, and with much justice, that it is unjust to make the present subscriber pay for costs which will not mature for many years ahead and in respect of which the price level is speculative. On the other hand, there are those who say it is sound finance to provide for this almost certain higher cost at once. The Post Office, by its small instalment for the future, has tried to arrive at a compromise which, while not seriously charging the present user, does make some provision for the future contingency and so makes less necessary a sudden and substantial increase in charges on this account.

Books Received

THE TELCON STORY.—A few copies of this book have been presented to the Editor by the Telegraph Construction & Maintenance Co., Ltd. (who have produced the story to mark their 100 years of existence), for distribution to Post Office Libraries. As this is a very limited edition, it will not be possible to meet all applications.

This is a very readable history of the great achievement of Britain (in effect, the firms now incorporated in Submarine Cables, Ltd., and a few others) in the making of over 80" of the world's submarine cables.

In 1843, Dr. Montgomerie in Malaya tried to interest the homeland in a "gum" obtained by tapping trees. Land-type covered telegraph lines and moulded articles found a sale, but the real start was in 1850, when the Brett brothers secured a concession for a cross-Channel cable. In 1856, work started on the first Atlantic cable. The story recounts the difficulties encountered: copper wire could be hard, brittle, soft or rotten, while electrical testing was crude. Professor Thomson (Lord Kelvin) helped to overcome these troubles and it was he who started the scientific developments of the century. The Atlantic work of the famous *Great Eastern* is mentioned; the 1865 cable, abandoned half-way; and the 1866 cable, largely a tribute to the determination of Daniel Gooch, of G.W.R. fame. Gutta Percha held sway for 70 years, and Balata had some use; then came Paragutta and K Gutta, which in turn may be substantially replaced by Polythene, first made available to the G.P.O. in 1937. The important metallurgical work associated with T.C.M. is mentioned—mumetal, rhometal, radiometal and other alloys of special magnetic properties essential to modern communications techniques.

Wars have greatly affected the work of the cable companies, from the cable made in 1855 for the Crimean War to the great work done in the recent war in carrier and H.F. cables for the fighting services (using Polythene, Teleconax and P.V.C.), as well as submarine cables. The latest developments in which the companies have co-operated with the G.P.O. are mentioned, namely the 1.7 in. diameter air-space coaxial cable and the submarine repeater. Most of the earliest carrier-telephony cables were for submarine use. Three submarine coaxial cables were laid in 1921, 15 years or more before coaxial land cables were introduced; the former, of course, were not exploited over an H.F. band width. Amazing though the progress made in 100 years

has been, there may be comparable advances yet to be made.

TECHNICAL INSTRUCTION FOR MARINE RADIO OFFICERS; ninth edition; published 1950 for "Wireless World" by Iliffe & Sons, Ltd.; approx. 9" x 5½"; 700 pages, copiously illustrated. Price 60 s. The object of the book is "To provide simple instruction for sea-going Radio Officers and others in the general principles and practice of marine wireless communications; and the ground-work covered provides a complete theoretical course for the Postmaster General's certificates". For this edition, revision has been carried out on a large scale, and additional chapters on the cathode-ray oscilloscope, U.H.F. generators and radar recognition systems have been included. These chapters are very clearly written and will be welcomed and valued by Radio Officers who contemplate undergoing a course of instruction in Radar Maintenance. There is also a useful chapter on "Maintenance of Marine Radio Installations and Possible Faults".

A little over a third of the book is devoted to describing current marine equipment as fitted by the Marconi Company and Siemens Brothers, and the diagrams and photographs are splendidly reproduced. It is questionable, however, whether the inclusion of such material is necessary: detailed technical and operating instructions are supplied with current equipment for the use of Radio Officers. As a textbook for students for the Postmaster General's certificates, the treatment of basic principles and fundamental theory is hardly adequate. For example, superheterodyne reception is covered in a few paragraphs, and the modulation of a transmitter by grid control has been given even less space. Too frequently it is assumed that the student already possesses fundamental knowledge; for example, a simple three-channel network is shown as requiring for its solution a simultaneous equation in six unknowns, and the accompanying statement that "the equations may be solved in the ordinary way, although this will be found to involve a great deal of work" will probably act as a deterrent to the student.

It is difficult, of course, in a work of this magnitude and range, to decide what to include and what to omit, but it is considered that the value of future editions would be enhanced if less space were given to descriptions of current marine equipment and more to fundamental principles.

The New Members of the Editorial Board

As announced on page 71, the Editorial Board has lost the services of Mr. J. H. Richardson, O.B.E., Editor since the inception of the Journal, and Mr. J. F. Murray. Their places will be taken by Mr. F. E. Ferneyhough and Mr. H. A. Ashton, C.B.E.

Mr. Ferneyhough, who assumes the functions of Editor, joined the Engineering Department in 1924 and since that time has had a wide experience in the Post Office. He was one of four sent from Headquarters in 1939 to inaugurate the Telecommunications Branch of the Welsh and Border Counties Region, reporting there for duty on the first day of the Region's existence. In April, 1946, he was appointed to the newly created post of Regional Public Relations Officer for the same Region, a post which he vacated on appointment as Controller in the Public Relations Department. Whilst in Cardiff, he has done a considerable amount of writing and broadcasting for the B.B.C.

Mr. H. A. Ashton, C.B.E., Deputy Regional Director, North Western Region, who replaces

Mr. J. F. Murray, O.B.E., as representative of the Regions, has had long experience of Telecommunications problems; his association with them dates back to the days of the National Telephone Company. Since then he has also had experience of Publicity and Sales work, having held the post of Assistant Controller of these services at Headquarters from 1933 to 1938, and that of Controller of Sales until 1944.

Mr. Ashton serves as a member on Panels of the Post Office Joint Production Council dealing with Telecommunications and with Internal Relations. Mr. F. R. Allcroft, the Assistant Editor of the Journal, is also resigning from membership of the Board, owing to a reorganisation of the Public Relations Department. His place as Assistant Editor is being taken by Mr. F. B. Savage. Mr. Allcroft has been Assistant Editor since the Journal was started and, throughout, his work for the Journal has been of great value. He takes with him the warm thanks of the Board and their best wishes for the future.

Editorial Board. R. J. P. Harvey, C.B. (Chairman), Director of Inland Telecommunications; H. A. Ashton, C.B.E., Deputy Regional Director, North Western Region; F. E. Ferneyhough, Editor, Controller, Public Relations Department; Sir Archibald Gill, Engineer-in-Chief; C. O. Horn, Deputy Regional Director, London Telecommunications Region; A. F. James, Assistant Secretary, Personnel and Accommodation Department; A. Kemp, Assistant Secretary, Inland Telecommunications Department; Col. A. H. Read, O.B.E., T.D., D.L., Director of Overseas Telecommunications; F. B. Savage, Assistant Editor, Public Relations Department; L. F. Watling, Public Relations Department.

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Contributions. The Editorial Board will be glad to consider articles of general interest within the telecommunication field. No guarantee of publication can be given. The ideal length of such articles would be 750, 1,500 or 2,000 words. The views of contributors are not necessarily those of the Board or of the Department.

Communications. Communications should be addressed to the Editor, Post Office Telecommunications Journal, Public Relations Department, Headquarters G.P.O., London, E.C.1. Telephone: HEADquarters 4330. Remittances should be made payable to "The Postmaster General" and should be crossed "& Co."